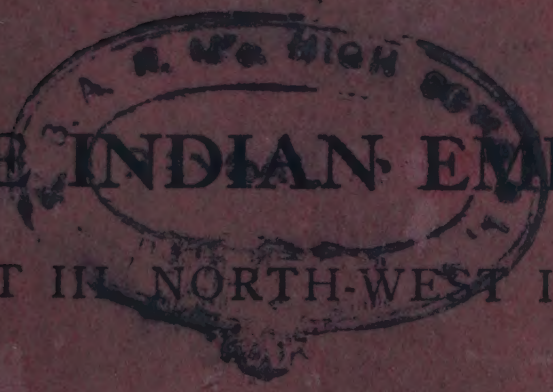
LONGMANS' REGIONAL
GEOGRAPHIES OF INDIA



THE INDIAN EMPIRE

PART III. NORTH-WEST INDIA

144

F. G. FRENCH
AND
L. DUDLEY STAMP

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PART III. NORTH-WEST INDIA

BY

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AND

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WITH 80 MAPS AND DIAGRAMS

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PREFACE

THIS book is the fourth of a series embracing the whole of India and Burma. Like its predecessors (*A Geography of Burma for Schools* and *Longmans' Regional Geographies of India, Parts I and II, North-East and Peninsular India*) it has been written with two objects in view. A prime essential in the equipment of every educated person is a knowledge of his own country and an appreciation of its relationship with other countries in the life and work of the world. The first book aimed at giving the boys and girls of Burma that instruction. The authors considered that India is too vast to be treated as a whole, for it is just as difficult for the boy or girl living in the Gangetic Plain to picture life in the arid north-west or the hills of Peninsular India as to picture conditions in a foreign country. The present book is therefore divided into two very distinct parts. The first part aims at imparting a knowledge of that part of India which to the boy living in the north-west may be called 'his own country'; the second part (which forms Part IV of *Longmans' Regional Geographies of India*) will extend the principles learnt in the first part to the whole of India and indicate the relationship between India and the world beyond.

The second object which has been kept in mind is that of presenting the matter in such a way as will, it is hoped, afford the teacher every possible help in his lessons, so that he may feel assured that his pupils thoroughly understand the great fundamental principles underlying the study of geography as exemplified in North-western India.

The general plan of each of the first nine chapters is the same—a simple introduction to the main geographical

principle involved followed by a study of how that principle works in North-western India. Chapters X to XIX treat in detail each Natural Region. Here the teacher may, if so desired, select first those which fall within the Province in which the school is situated. The chapter devoted to Political Divisions will assist in this respect. These are followed by a chapter on Communications which serves to link up what has gone before. The last chapter sums up the whole by a study of local trade, including foreign trade from the area studied. Part IV, where the whole of India is treated, will then follow on naturally, but if the teacher has omitted any of the Chapters X to XIX they should be taken before Part IV or during the work of Part IV.

A word is necessary on the exercises at the end of each chapter. Help for both teacher and pupil has been the great consideration in the wording and arrangement of every paragraph in the book and various teaching devices of proved value have been enlisted in this cause ; simplicity of presentation (by no means an easy task in the case of many important geographical principles), maps, diagrams, comparisons, and homely illustrations—aids which have proved of use in the actual teaching of the subject have been included. But it is not possible to put every question that the teacher must ask his pupils, or to give every exercise possible and necessary for a thorough ' driving home ' of every point. Therefore the exercises are meant to serve as guides only. The teacher should draw up at least twenty more exercises on each chapter similar to those given. Original exercises are the life and soul of good teaching, and the study of geography offers a most delightful field for this work. Questions which demand merely a reproduction of the text are deadly dull and unprofitable, and mark the teacher who sets them as a failure. Original exercises are a pleasure to the teacher who invents them, and a source of delight to the pupils who solve them.

This volume follows the scheme originally drawn up by one of us (F. G. F.), elaborated and used by both of us in the volume for Burma, but the present work has been written entirely by one of us (L. D. S.) who must be considered responsible for the facts therein. The work is based almost entirely on Official Publications, especially Census Reports and Annual Reports on Rainfall, Agriculture, Irrigation, Railways, Sea-Borne Trade, Commerce, etc., published by the Government of India and some Provincial Governments. The authors wish, however, to record their indebtedness to Douie's ' Kashmir, Punjab and N. W. F. Province ' (*Provincial Geographies of India*).

Mr. H. L. Chhibber, M.SC. (Lahore), F.R.G.S., has kindly read through the regional part and assisted the authors by placing at their disposal his wide knowledge of his native land.

Finally, the book contains nothing which is beyond the comprehension of Middle School pupils. Special attention has been paid to the requirements of the various Middle School Syllabuses in the Provinces of the North-West, Punjab, Bombay, etc. and the States of Kashmir, Rajputana, etc., and every attempt has been made to include all information on the Province or State and India required by the varied curricula in the different Provinces and States.

Rangoon, 1926. L. D. S.

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FIG. 1.—Map of the World, showing the British Empire in black. The principal steamer-lines from Rangoon to other parts of the world are shown, and the number of days' sailing for each stage of the journey. An average rate for modern steamer is 300 miles a day.

A Geography of North-Western India for Schools

CHAPTER I

POSITION AND SIZE

1. A number of the countries of the world are joined together into one great family. Counting the little ones and the big ones, there are about thirty members in this family, and India is one of them. The name of the family is 'The British Empire', or 'The British Commonwealth of Nations.' It is the largest Empire the world has ever seen.

The oldest member of the Empire, the British Isles, is not situated in the middle of it. India is much nearer the middle of the Empire, for there is only one important part of it, Canada, which is very far away from India. Look at Fig. 1 and you will see that it is quite easy to leave this country in a steamer and reach China, Africa, or Australia.

Fig. 2 shows the size of India compared with that of other countries in the British Empire. The area of India is 1,800,000 square miles; the part we are going to study in this book is 700,000 square miles or more than $\frac{1}{3}$ of the whole. From Bombay to Srinagar in Kashmir is 1,075 miles. From Gwadar in Baluchistan to Delhi is 960 miles. These figures will help you to realize the size of the country. This part of India is divided into the Provinces of the Punjab and the North-West Frontier; Sind and a part of Bombay Presidency; and the native States of Kashmir, Baluchistan, Rajputana, Baroda, etc. We are going to study then, your own district and the surrounding regions.

2. Look in your atlas and find a map with the Tropics of Cancer and Capricorn marked. Cancer passes through

India, therefore this country is partly in the Temperate Zone and partly in the Torrid Zone. Which part is in the Torrid Zone? All places in the Torrid Zone are not equally hot. Bombay and Colombo are both in this zone, but Colombo is hotter than Bombay. On Fig. 1 a thick

FIG. 2.—The different countries of the British Empire, showing their comparative sizes.

black line is drawn. All the countries marked inside that line are the hottest countries in the world. Notice that

our part of India is not quite inside the line, but is very nearly inside it. Our country is, therefore, a very warm country.

3. On every map lines of latitude are marked to tell us how far a place is north or south of the Equator. The North and South Poles are farther away from the Equator than any other places. They are 90 degrees away, and you could not go farther than that. Bombay is 18 degrees north from the Equator, that is, in latitude 18° N. Lahore is in latitude 31° N., while places in India on the Tropic of Cancer are in latitude 23½° N. Thus we see that a part of the country lies south of the Tropic of Cancer. This is a very important fact, for it means that in all places in India south of Ahmadabad the sun is almost overhead at twelve o'clock noon every day for half the year, and that it is exactly overhead on two occasions. Now a place which is directly under the sun gets more heat than a place which is sloping away from the sun. If you wished to fill a bucket with rain water during

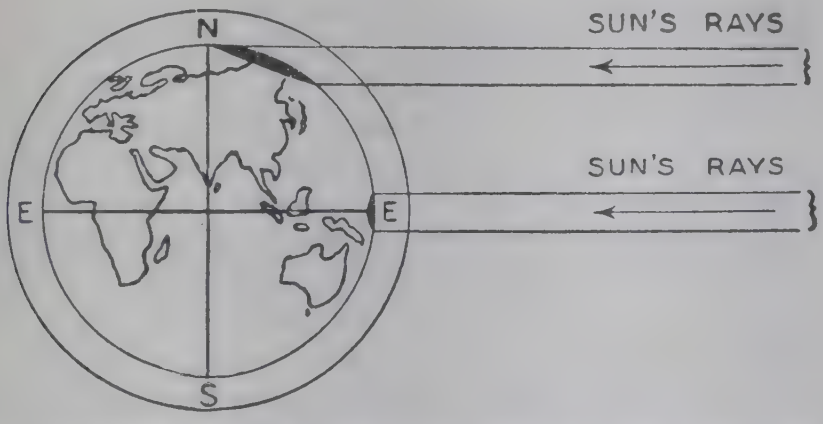


FIG. 3.—Diagram showing that at the Poles the sun's rays are spread out over a large area and cannot make the earth so warm as in the Tropics.

a heavy storm, you would stand it upright on the ground so as to catch as much water as possible. If you allowed your bucket to stand in a sloping position, it would not collect the same amount of water. In the same way, heat is being poured on to the earth from the sun, and the places which are directly beneath the sun receive the greater amount of heat. You will see this illustrated in Fig. 3, and this explains why India is a hot country.

4. On every map lines of longitude are marked to tell us how far any place is east or west of Greenwich in England. The line of longitude which passes through Greenwich is marked 0 degrees. Lines to the east of this towards India and China are marked with figures up to 180 degrees, and lines to the west of Greenwich, towards America, are marked up to 180 degrees. Lahore is in longitude 74 degrees east of Greenwich, or, as we generally write it, long. 74° E.

Now since the world turns completely round from west to east once in 24 hours, the 180 degrees east of Greenwich and the 180 degrees west of Greenwich, or 360 degrees in all, pass the sun in that time. That is, the difference in time between places 1 degree away from each other is 4 minutes. Work the sum for yourself—24 hours divided by 360. As the earth turns from west to east, India faces the sun sooner than Greenwich faces it. As Lahore is 74 degrees east, it passes the sun 74 $\times$ 4 minutes earlier than Greenwich in England. Thus, when it is nearly five in the morning in Lahore, it is about midnight in London.

5. Now let us turn to Fig. 7 or 71 which are maps of North-western India. The scale of the map is given at the bottom. It is $\frac{1}{3}$ inch to 100 miles. That is every time you measure $\frac{1}{3}$ of an inch with your ruler, you have measured 100 miles. Measure the distance between Bombay and Delhi. It is really 730 miles. Do you get this answer? Now measure the distance between Karachi and Lahore and the distance between Peshawar and Jodhpur.

6. Trace the map in Fig. 7 on to squared graph paper. You can do this by putting a piece of carbon paper beneath it and using a pointed piece of bamboo. Count the number of squares on the graph paper covered by your traced map of North-western India. Measure the length of the side of one square. Perhaps it measures $\frac{1}{4}$ inch. Then, since 1 inch represents 300 miles on the map, $\frac{1}{4}$ inch means 75 miles, and the amount of India covered by each square on the graph paper is 5,625 square miles. Now you can discover what is the area of your part of India. If the squares on your paper are not $\frac{1}{4}$ inch but another size, you can still work out the area of the country in this way. If you take Fig. 70 you can work out the area of your own province.

QUESTIONS AND EXERCISES

1. Name the ten largest countries in the British Empire, arranging them in order of size.

2. What parts of India are in the Temperate Zone? Name three places which are just on the border between the Torrid Zone and the Temperate Zone in India.

3. Trace a map of North-western India on to squared paper. What area of our country is in the Torrid Zone?

4. Where does the sun rise earlier, at Karachi or Delhi? Why?

5. Name the parts of the Empire shown in Fig. 1, and the races of people who inhabit each part. Make a table like the following :—

Country	People	How to get there	How long it takes to get there

6. Place a globe in the sunshine so that the sun shines directly on the Equator of the Globe, after a few minutes you will be able to feel with your hand that the Equator of the Globe has received much more heat than the Poles.

CHAPTER II

PHYSICAL FEATURES

1. Before you attempt to read any more of this book or to learn about the geography of India, you must be quite sure that you understand exactly what a map is. You know that you can draw a picture of a large thing on a small piece of paper. A map is like a picture of a country. Fig. 4 is a picture of North-western India as it would look if we could get up very high into the sky and look down on it. The country does not appear quite like Fig. 4 to a man in an aeroplane because the aeroplane cannot climb high enough into the sky.

If you tried to draw a picture of your school on a small piece of paper, you would not be able to show every detail. You could not put in every brick or every piece of wood which goes to make up the building, and so in your drawing you only show the shape and certain important things. A map is just like that. You can only show a few things on it. You will find in this book that there are many maps of North-western India which are drawn to show different things. In every one you have the shape of the country as it would appear from a great height and in most of the maps there are square dots to show the principal town of each province, Srinagar, Peshawar, Lahore, Karachi, Bombay and Delhi. Then the boundaries of the provinces are marked by dotted lines and the principal rivers by black lines. When we have got outline maps like that we can show on them what details we like and so, although the outline of the maps in this book is often the same, the details they show are quite different.

Let us first look at the physical features of our country, that is, the mountains, hills, valleys and rivers. The main mountain ranges and valleys of our country are very simply arranged and easy for you to understand. In the far north is the great mountain wall formed by the Himalaya Mountain. This wall is over three miles high and some parts

FIG. 4.—Photo-map of North-Western India.

of it are five and a half miles high. Some of the peaks are so high that no one has ever been able to climb to the top. Mount Everest is the highest of all, but it is not in the part of India we are studying. One of the highest peaks in Kashmir is Mount K2 or Mount Godwin Austen. On the other side of this mountain wall is a great plateau, the highest plateau in the world. It is so high that it is sometimes called 'The Roof of the World.' Most of this great plateau lies in the country of Tibet but the boundary of India includes a part of it in Northern Kashmir. You see that our country is quite cut off from the north by this great wall. There are a few narrow gateways in the wall, through which rush mighty rivers like the Indus.

In the west is another mountain wall which cuts off our country from Afghanistan and Baluchistan. It is not so high as the Himalayan Wall but is still very difficult to cross. Notice from Fig. 8 that where this wall and the Himalaya Mountains join there is a great knot of mountains called the Pamir Knot. From there the western wall sweeps down as the great range of the Hindu Kush, separating India from Afghanistan and then continues as the Sulaiman Range which divides the Indus valley from the dry plateau of Baluchistan.

2. In the south-east of the part of India we are studying, we notice there is a large area of land which does not consist of high mountains, but is a broad area of high land with a top which is nearly flat. Like the big flat-topped area north of the Himalaya Mountains this is a plateau or table-land. It is called a table-land because it is raised up from the low land but has a flat top almost like a table. Except where it has been cut into by deep river valleys like those of the River Tapti and River Narbada, or where there are mountain ranges like the Aravalli Range standing up on its surface, the plateau is about 2,000 or 2,500 feet above the level of the sea. This plateau is part of the great plateau which stretches over the whole of that part of India known as Peninsular India.

Between the Plateau of Peninsular India and mountain walls of the north and west, are the broad flat plains of the Indus and its tributaries, and of the Ganges and its tributaries. The Valley of the Ganges is one of the most important, most fertile and most thickly populated valleys

in the world. The Indus and its tributaries run through much drier country but the rivers can be used to water the land and so the Indus Valley is also an important one. Both the River Indus and the River Ganges slope very, very gently towards the sea. One thousand miles from their mouths the surface of the water is only 500 feet above the level of the sea so that the river only drops six inches in each mile.

Between the Indus Valley and the Ganges Valley there is no barrier or mountain wall. If we follow up the Ganges Valley we come to Delhi and then we cross over a very low divide and find all the rivers are flowing westwards to join the Indus. We can, then, travel very easily from the valley of the Indus to the valley of the Ganges. In past ages, as you learn in your history, many peoples have invaded India and have come from the north-west. They travelled across the Indus, through the plains of the Punjab and past Delhi into the rich fertile valley of the Ganges. The people could not go to the north for there is the great mountain wall, they did not go to the south because there is the Plateau of Central India with its mountain ranges like the Aravalli Range, the Vindhya Range and the Satpura Range. Travelling is more difficult there and the land less fertile. It is because Delhi stands in such an important position between the two valleys that it has been made the Capital of India.

There is another fact about the physical features of our country we must notice. The land does not rise abruptly from the valley to the plateau ; it slopes upwards gradually through the dry barren region known as the Thar or Great Indian Desert. Then between the edge of the plateau and the Arabian Sea there is a strip of lowland—a coastal plain.

3. It will help us to realize still more clearly where the hills and mountains of North-western India are, if we imagine the sea has risen 1,000 feet—that is four or five times as high as the tallest building you can think of. If this could be, our country would look like Fig. 6. Compare this with Fig. 5 which is North-western India as it actually is.

In Fig. 6 notice the Himalayas on the north and the great high Plateau of Tibet beyond. Notice also the mountain

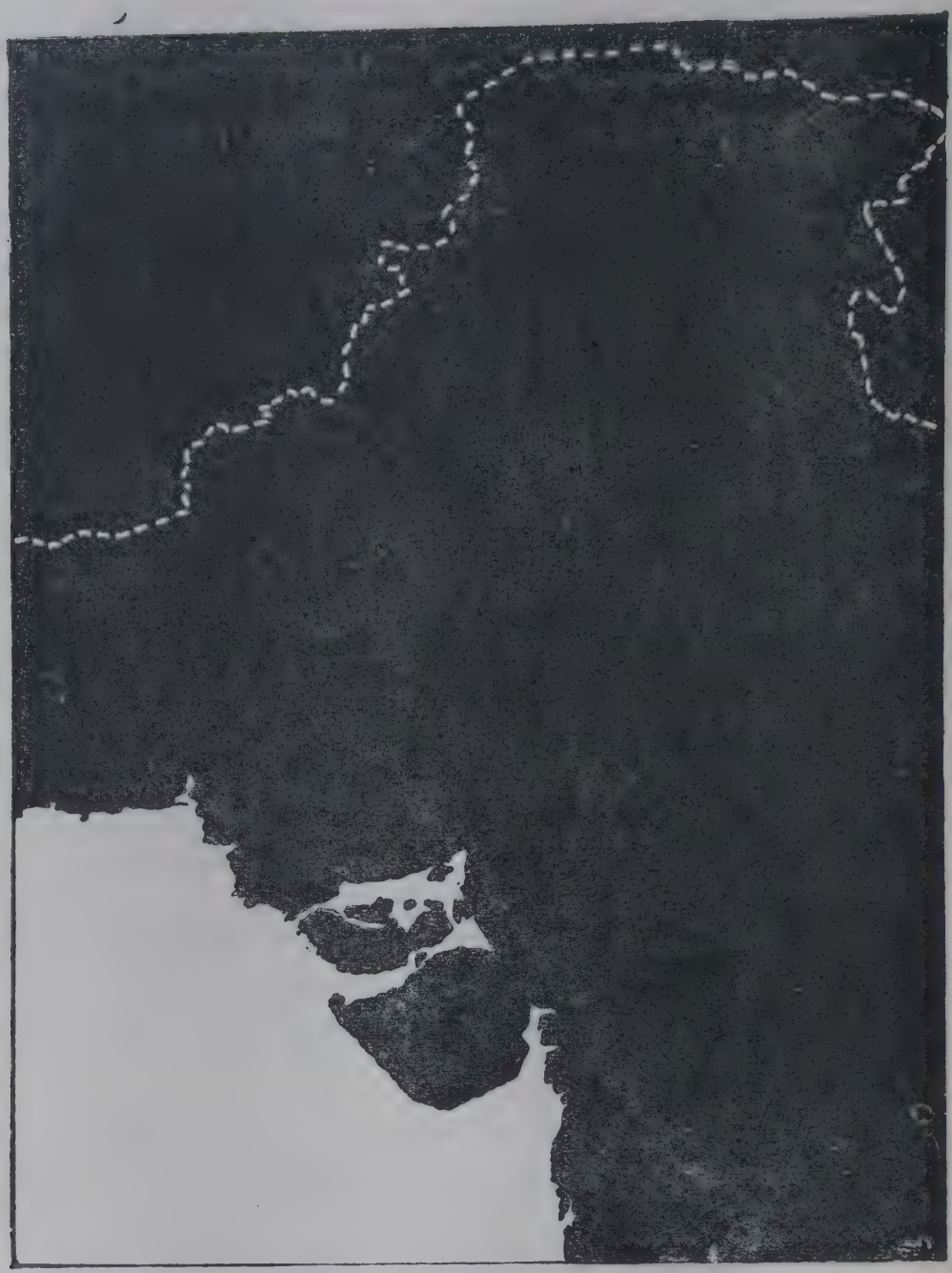


FIG. 5.—North-Western India as it is now—all land black.

FIG. 6.—North-Western India as it would look if the sea rose 1,000 feet.

FIG. 7.—Contour or physical map of North-Western India. Land over 3,000 feet, black; land 1,000 to 3,000 feet, dotted; land below 1,000 feet, white.

walls on the west with the high land of Afghanistan and Baluchistan beyond and the Plateau of Peninsular India on the south-east. But the sea now covers the whole of the Indus and Ganges Plains and the coastal regions, except for the hills of Kathiawar and Cutch which remain as islands.

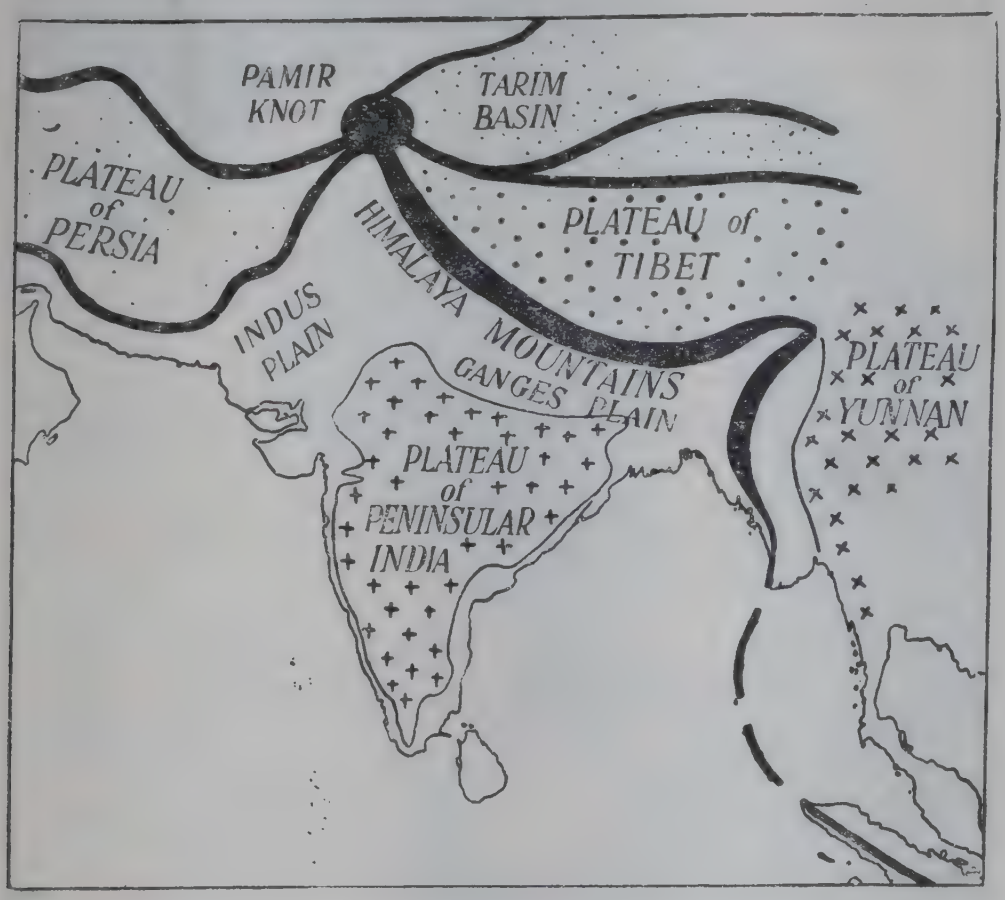


FIG. 8.—The Mountains and Plateaux of Southern Asia. Plateaux of old hard rocks marked by crosses, fold mountains marked in black lines and younger plateaux by dots.

Turn now to Fig. 7. Here all the land more than 1,000 feet above the level of the sea is dotted. If the sea could rise still higher—if it could rise 3,000 feet, India would be nothing but a great mass of mountains on the north and west and strings of islands. Those parts which are shown

FIG. 9.—The Mountain Wall of North-Western India. Land over 1,000 feet, dark. 1=The Bolan Pass ; 2=The Gomal Pass ; 3=The Khyber Pass ; 4=The Makran Coast Route.

in black on Fig. 7 would be the only land to be seen Fig. 7 is called a contour map, that is, a map with lines (contours or contour lines) drawn on it to show the parts of a country which have the same height above the level of the sea. In this case the lines show those parts of North-western India which are higher than 1,000 feet above the sea and those higher than 3,000 feet. The lines are called the 1,000-feet and 3,000-feet contours. Remember that any place situated exactly on the 1,000-feet contour is exactly 1,000-feet above sea-level and any place exactly on the 3,000-feet contour is exactly 3,000 feet above the sea. If you look in your atlas you will find a contour map of India, but it will be coloured in green, light brown and dark brown, to make the divisions of different heights show up more clearly.

4. Before we leave the mountains of North-western India, let us look at the gateways through the Mountain Wall. They are shown in Fig. 9.

First there is the Bolan Pass (marked 1 on Fig. 9) which leads from the Lower Indus Valley to the town of Quetta in Baluchistan. Then there is the less important Gomal Pass (No. 2) leading to Waziristan. No. 3 on Fig. 9, the Khyber Pass, is the most important of all and leads from North-west India to Afghanistan. Another route out of India is along the coast to Persia (No. 4 on Fig. 9).

5. Notice from Fig. 4 or 7 that it is difficult to get to the sea from the districts of North-western India. Even travelling along the valley of the Indus it is a very long way. So we find many of the inhabitants of the Punjab or Kashmir have never seen the sea. It also explains why the inhabitants do not go to sea to earn their living as sailors. Look at a map of the British Isles. Put your pencil anywhere you choose on that map and you will see that the sea is not very far away ; either there is a big bay near or the sea enters a wide river mouth, and so reaches the heart of the land. This explains why English people like the sea and why many of them are sailors. In India the people who go to sea are those who live near the sea—as on the Bombay Coast. Similarly the people who live in Norway and the Japanese are good sailors, while the Russians and Egyptians are not. Examine the maps of their countries and say why it should be so.

6. Let us go back and learn a little more about the rivers of North-western India.

Look again at Fig. 7 and notice that there are a number of rivers which flow down from the Himalaya Mountains. Later they all join the Indus and flow together to the sea. ' Punjab ' as you know means ' five rivers ' and the five most important rivers which join the Indus are the Sutlej, Bias, Ravi, Chenab and Jhelum. They are all fed by the snows of the great Himalaya Mountains and the Plateau of Tibet. In the mountains they are rushing torrents at the bottoms of deep narrow valleys but when they reach the plains they broaden out and become great, broad, gently flowing rivers. They wind about for great distances before joining one another and finally meeting the Indus. The Indus itself also flows down from the snowy Himalayas but its valley is separated from the Punjab Plains by the dry hills of the Salt Range.

When all the rivers have joined the Indus, the valley becomes narrow and the river flows through a narrow gorge, near the borders of the provinces of Punjab and Sind, before the valley broadens out again to form the Lower Indus Valley and the Delta.

In some countries the rivers form the principal means of communication. Boats carrying goods and passengers are continually going up and down. In North-western India, it is not so. As we shall learn later the water of the rivers is more valuable for watering the land and making it fertile.

The rivers which rise in the Plateau of Peninsular India are quite different from those which rise on the Himalaya Mountains. No snow falls on the Plateau and so the rivers cannot be fed by melting snow. They are only fed by the rain which falls in the rainy season. And so the river beds are often dry except in the rainy season. Near the south of the area we are studying, two rivers flowing from east to west have cut deep narrow valleys for themselves. These two rivers are the Tapti and the Narbada. Their deep valleys have formed important obstacles for peoples trying to travel from north to south over the plateau. The other rivers flowing down from the hill ranges of the plateau such as the Aravalli Range are not very important. Why do you think they are little used by ships ?

QUESTIONS AND EXERCISES

1. Show by a sketch-map the position of the mountain wall of North-western India, and name its different parts.
2. What connexion is there between the mountains of North-western India and other parts of Asia?
3. What is meant by a contour and a contour map?
4. Describe the course of the most important rivers of North-western India (with sketch-maps).

CHAPTER III

GEOLOGY AND MINERALS

1. In the last chapter you have learnt that some parts of our country are occupied by rugged mountain ranges, others are broad fertile river valleys, whilst still other parts are rolling plateaux or table-lands. Now, why should this be so? The answer to that is, it is the work of rain and rivers. We will now see how rain and rivers have altered the surface of the country. During the rainy season you have seen the rain-drops pattering on the road and running together to form little streams which carve beds or little valleys for themselves out of the dust and mud. The first action of a river is exactly like that. The river carves out its bed and makes it deeper, so that a section across its first little valley is shaped like diagram A in Fig. 10. At the same time as this is going on the rain is falling in the valley, and the steep edges of the river banks are broken off and fall into the stream, which carries the soil away. In this way, the river valley is widened and takes on the shape shown in diagrams B and C in Fig. 10. Then you must remember that the stream does not flow quite straight. The water swings from side to side and helps to make the valley broader. Gradually the river carves out for itself a broad, flat-bottomed valley, shaped in section like diagram D in Fig. 10.

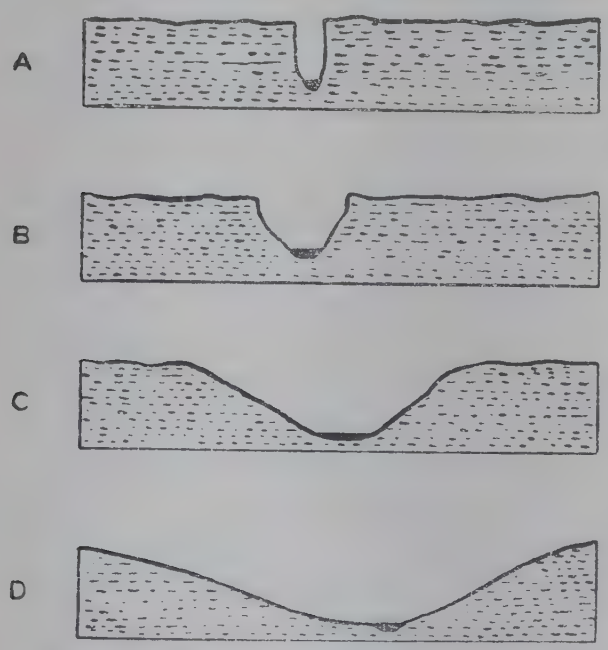


FIG. 10.—Diagram of river valleys.

Now the rain and rivers will eat away the land much more easily and quickly where the soil is soft than where the soil is rocky and hard. So in India we find that where the rocks are hard they have been left to form the hills and mountains, but the soft parts have been washed away and the broad river valleys formed.

Before we leave the rivers there is something else to notice. If you have looked at the rivers of North-western India, such as the Indus you will remember that the water is nearly always muddy. This mud is the fine dust and clay which the rain washed out of the soil in some distant region, and which the river has carried along for great distances. When the river is in flood, that is, at the high-water season, it spreads over part of its banks and some of the mud is spread over the ground. But most of the mud is carried along by the river till it reaches the sea. There the mud is dropped by the river so that the shallow sea at the mouth of the river is filled up and a piece is added to the dry land. This is how the great delta of the Indus has been formed. The fine mud dropped by the river makes very fertile soil. The soil is called alluvium. So we find stretches of alluvium on each side of the courses of great rivers as well as making up their delta.

2. Perhaps you are wondering why the rocks in some parts of India should be hard and in other parts soft. The study which teaches us about the stones of the earth's crust and the changes which take place on its surface is called geology. We do not know very much about the inside of the earth. We know that it is very heavy and is probably almost a solid mass of iron. The part of the earth we can see is the earth's crust—all the mountains, the valleys, the seas, and great oceans. The earth is rather like a big round mango, and the crust of the earth is like the skin of the mango. Now the geologist calls all the materials which make up the crust 'rocks'. There are rocks of all kinds, some are soft and some are hard. Rocks are not all of the same age, some are younger than others. Every year the Indus and its tributaries are bringing down mud and dropping it near its mouth, so that the alluvium of the Indus or any of the Punjab rivers is both a very young rock and a very soft one. As a rule, the older the rock the harder it becomes.

We know that when a man goes down into a deep mine, he finds the air and rocks around him getting hotter and hotter. If he were able to go down far enough, it would become much too hot for him to live. Many miles down, in the lower part of the crust or skin of the earth it is so hot that the rocks are sometimes melted. In some parts of the world there are holes or cracks through which the molten rock can come out. We call these holes or cracks volcanoes. The molten rock which comes up is called lava. It is red-hot when it is first poured out, and takes a very long time to cool. Sometimes one volcano is found all alone, at other times there are numbers of them close together in a line. There are no volcanoes now in our part of India but there used to be a big solitary one in Central Burma, but now it is dead or, as we say, 'extinct'. This volcano is Mount Popa. The lava which it has poured out has built up a mountain 4,000 feet high. In the extreme southern part of the area we are studying in the Bombay Presidency huge areas of country consist of lava which has been poured out by volcanoes. We call this the region of the Deccan Lavas.

3. We have now discovered that there are two very different kinds of rock. There are layers of mud, sand, and stones which are laid down by rivers, or in the sea, or in lakes, or even the dust which is blown from one place to another by the wind. All these are called Sedimentary Rocks. They are at first soft, but after a long time may become compressed and hard. Then there are the rocks which have been molten and then become solid on cooling. They are called Igneous Rocks. There is one more important kind of rock. Where the sedimentary rocks have been made very hot by being near the big masses of molten rock, or for other reasons, they have been quite changed and are called Metamorphic or Crystalline Rocks. If you live in Rajputana most of the hills there consist of this crystalline rock. If you look at it carefully you will see that it consists of shining pieces or 'crystals'. Some of the crystals are white, some are dark.

4. Just like the igneous rocks, nearly all the ores of the valuable and useful metals like gold, silver, lead, zinc, tin and iron, have their origin deep down in the earth's crust. So it is that we find the important minerals either close to

the igneous rocks or else where the rocks are old and full of cracks through which the ores have come up from their

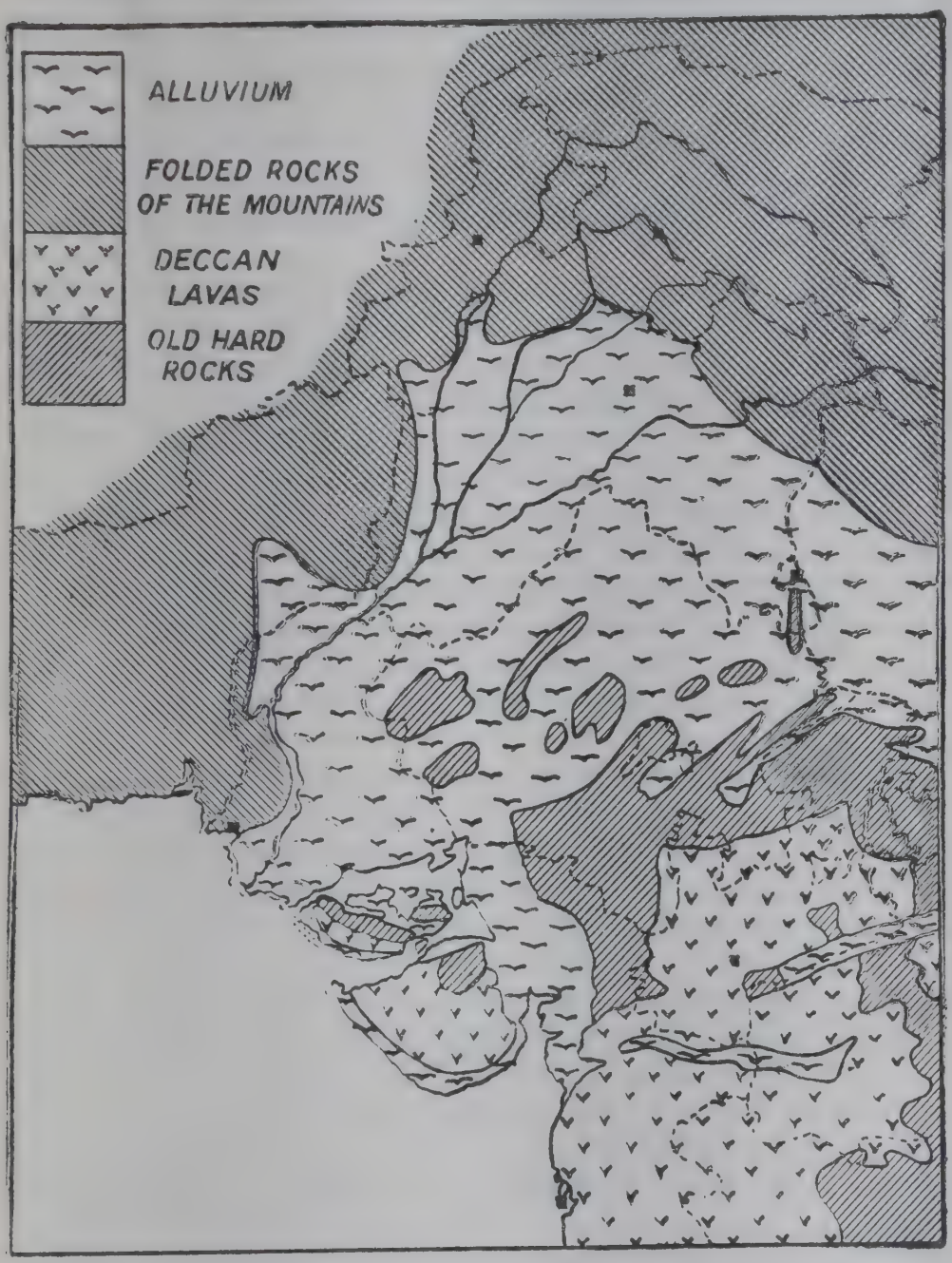


FIG. 11.—The Geology of North-Western India.

place of origin deep down in the earth. Most of the ores came up not as we see them now, but, as we say, 'in solution'. You can make a 'solution' of salt or sugar in

water, and similarly, deep down in the earth, the ores of metals form a solution. All this is important, because we find the valuable deposits of ores in the old crystalline or igneous rocks. But as we saw earlier in the chapter, rain and rivers can wear away the land, and sometimes the ores, too, are worn away and carried down into the river valleys. Deposits of ores occurring thus in the river valleys are called alluvial deposits. Precious stones like rubies and diamonds are also closely connected with the older rocks or the igneous rocks.

5. There are two very important substances, however, which always occur in the sedimentary rocks. These are coal and mineral oil. Both of them have really been formed from vegetation—plants which grew in past ages and have been buried by masses of river sediment, and have become changed into coal or oil. Oil occurs in the newer sedimentary rocks as it does in the Attock District of the Punjab. Coal we find also in sedimentary rocks but there is very little in North-western India. Look at Fig. 11. You will now see that you must not expect to find oil or coal and lead or tin in the same parts of a country. Another valuable mineral is rock-salt, found in the Salt Range and Baluchistan.

6. Have you ever been sitting or lying down and then suddenly felt the earth begin to shake? Probably you have, and know that you have felt an earthquake. That will tell you that the crust of the earth is not perfectly still. Probably as a result of the molten igneous rocks moving in the lower parts of the crust, the surface of the ground is not steady, and the rocks become folded or bent. In the course of long ages, small earthquakes and big earthquakes push up some parts of the earth's crust and press other parts down. Also the movements fold the rocks just as you could fold your exercise book if you lay it out on the desk and then press it from either side. In this way big wrinkles are formed on the crust of the earth, just as you can see wrinkles on the skin of some mangoes. When sedimentary rocks are folded in this way they are compressed and made hard. The wrinkles form the lines of mountains of hard rocks. Now you will understand why some parts of India are mountainous and built up of hard rocks, whilst other parts consist of soft rocks which are easily worn away.

7. We will now go back and see how the physical features and the geology of North-western India are connected. The great Mountain Wall of the north and west consists of hard, tightly folded sedimentary rocks. Rain and rivers—and frost too, for it is very cold in these high mountains—are now busily wearing away these great ranges and will gradually wear them down so that they are much lower than at present. On the fringes of the great folded ranges the rocks are less folded and we find oil fields as for example, near Attock.

The great plateau of Peninsular India is formed mainly of a mass of very, very old metamorphic or crystalline rocks. In long ages past they were sedimentary rocks, very much folded, but they have been changed by heat and pressure into a great mass of crystalline rocks. All these changes took place long ago and for ages the greater part of Peninsular India has remained unchanged; only very slowly being worn away by rain and rivers. The Plateau was very like it is now when the great Himalaya Mountains were still under the sea. You can picture the enormous number of earthquakes it has taken to raise the great Himalaya Mountains from the bottom of the sea to the great height which they are at present. During that time the rocks of Peninsular India have remained almost unchanged. In these old crystalline rocks we find many different kinds of minerals and valuable ores.

One very important event occurred just before the Himalaya Mountains began to form. Severe earthquakes occurred in Peninsular India and great cracks were formed in the earth's crust. Out of these cracks there poured enormous quantities of molten rocks or lava. The lava spread over thousands of square miles of the plateau. The action of the weather has changed the surface of the lava into a sticky, black soil which is very suitable for growing cotton and so is often called 'Black Cotton Soil.' Notice on Fig. 11 where these lavas are found.

Nearly all the low lands of our part of India are formed of mud or alluvium deposited by the great rivers. The chief exception is in the driest parts like the great Indian Desert where there are vast sandy wastes and the sand has been deposited by the wind. Even now the Indus is adding to its delta and gradually pushing it further out to sea. The

Indus and its tributaries may in places overflow their banks and leave a thin coat of mud on the surface of the land. The rivers too often change their courses, sometimes depositing mud in one place, sometimes in another. In this way the broad flat plains have been built up. We find that there are two kinds of alluvium—the old alluvium and the new alluvium. The new alluvium we find in the delta—there is not a stone of any kind to be found. In the old alluvium which is found over the Punjab Plain there are little hard pieces called ' Kankar '.

Study carefully Fig. 11, which is a simple geological map of North-western India. Remember that all the great changes like the building of the plateau, the pouring out of lavas and the rise of the Himalayas took place long before there were any men living in the world.

QUESTIONS AND EXERCISES

1. What is the principal difference between the valley of a young river and the valley of an old river? Give examples from North-western India of each class.
2. What is alluvium and how is it formed?
3. What is a volcano and how is it formed?
4. Why would you not expect to find oil and lead-ores in the same place?
5. Give a simple classification of the rocks of the earth's crust, with reasons for your arrangement.
6. Make a collection of any rocks you can and classify them.

CHAPTER IV

CLIMATE (1)

1. In the ' Hot Weather ' you feel very hot in school, but in the ' Cold Weather ' you are not so uncomfortable, because the weather is cooler. When we speak of the amount of heat or cold the weather has we use the word ' temperature.' The temperature of a place at a certain time is the amount of warmth we feel there. ' Very hot,' ' Hot,' ' Cool,' are words which do not tell us the amount of warmth exactly. You may say that the day is ' very hot ' when some one else thinks that it is only ' hot.' We must have a more exact way of describing temperature than this, and so we use the thermometer. The word ' thermometer ' means a heat measurer. That is exactly what a thermometer is.

Fig. 12 is a picture of a thermometer. When things are heated they get bigger, or, as we say, they expand. If you get a toy india-rubber balloon and blow into it as much air as you can, and then hold the balloon near a fire, you will see it get bigger and bigger until it bursts. That is because the air you blew into it has become heated by the fire and has expanded until the balloon was not big enough to hold it. In a thermometer there is either mercury, which looks like silver, or alcohol which looks like water. The mercury or alcohol is warmed or cooled by the air of the place in which the thermometer is placed. When the air is getting warmer and warmer, the mercury, or alcohol, expands and rises up the thermometer tube. When the air around cools, the mercury, or alcohol, gets smaller again, and sinks down the tube. On the glass of the tube are marked little divisions so that we can tell exactly how long the stream of mercury, or alcohol, is, and this, of course, tells us exactly how warm the air outside the thermometer is, because it is the air around that makes the mercury warm or cool.

Just as you can measure weight either by English pounds, Indian seers, or Burmese viss, so there are different

'scales,' as they are called, for measuring temperature. The two most important scales are the Centigrade and the Fahrenheit scales. The thermometers are made in exactly the same way, but the little divisions on the Fahrenheit thermometer are marked differently from those on the Centigrade thermometer. Sometimes you can buy a thermometer mounted on a piece of wood, showing the Centigrade scale on one side of the thermometer tube and the Fahrenheit scale on the other. The inventor of the Fahrenheit scale marked the height of the mercury in the thermometer when it was as hot as boiling water, and called the mark 212 degrees (written 212°). Then he marked it again when it was cold as ice which is just beginning to melt. This mark he called 32 degrees. So between Freezing Point (ice) and Boiling Point on the Fahrenheit scale there are 212—32 = 180 little divisions or degrees. The inventor of the Centigrade scale called Freezing Point 0 degrees and Boiling Point 100 degrees, so that on his scale there are 100 little divisions between these two marks. The Fahrenheit scale is the one most generally used for measuring the temperature of the air. That is the thermometer shown in Fig 12, and the thermometer we shall use in this book.

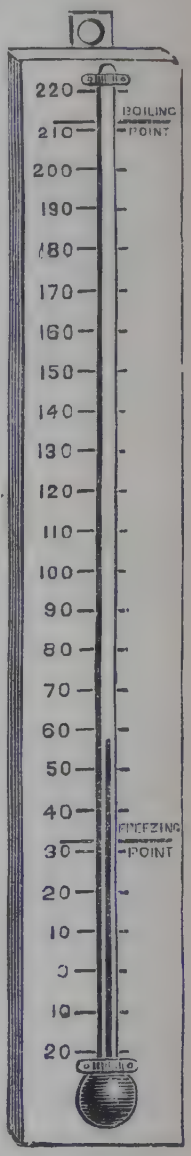


FIG. 12—A Fahrenheit thermometer.

2. Now we can understand how the temperature in different parts of our country is measured. Wherever there is a Government hospital in North-western India and in many other places where there is no hospital, some one has the duty of looking at the thermometer every day at a certain fixed hour, and of writing down in a book the number of degrees to which the mercury has reached. As a matter of fact, the man who does this has two thermometers. Each of them has a little piece of glass or metal inside the tube with the mercury or alcohol. In one thermometer this little piece of glass rests on the top of the mercury and is pushed along the tube as the mercury

expands. When the air around gets cooler and the mercury sinks back down the tube, it leaves the little piece of glass behind at the highest point in the tube to which it reached when the air around was hot. Thus the little piece of glass shows the highest temperature reached on that day.

In the other thermometer which the man has, is alcohol, not mercury, and the little piece of glass is inside the stream of alcohol. As the alcohol shrinks when the air around gets cool, it drags the glass marker back with it. Thus the second thermometer shows the coolest temperature reached during the twenty-four hours. Every

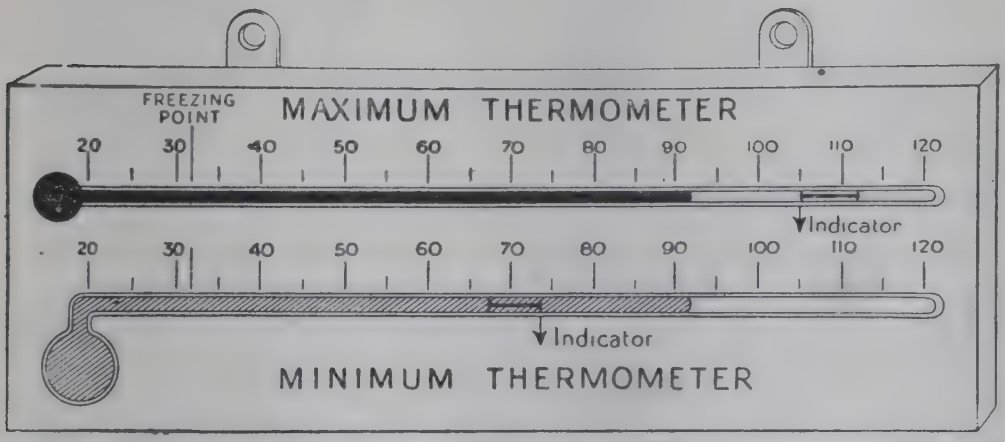

FREEZING POINT
MAXIMUM THERMOMETER
20 30 40 50 60 70 80 90 100 110 120
Indicator
20 30 40 50 60 70 80 90 100 110 120
Indicator
MINIMUM THERMOMETER

FIG. 13.—Picture of Maximum and Minimum Thermometers at Lahore.

morning the man in charge shakes the little glass indicators into their proper position again. Fig. 13 shows these thermometers mounted together on a piece of wood. They are called Maximum Thermometer, that which shows the greatest temperature, and Minimum Thermometer, that which shows the least temperature.

FIG. 13 shows the two thermometers as they might appear when looked at in Lahore, or any of the dry parts of North-western India, in the months of June or July. Study the picture carefully. The maximum thermometer is filled with mercury and the minimum with alcohol.

When the man who looks after them has written down the Maximum temperature and the Minimum temperature, he adds the two numbers together and divides by two. As you know from your arithmetic lessons, this must give him

the 'Average' or 'Mean' temperature for the day. Then he enters the three temperatures in his book.

Here is the entry in the book at Rangoon for the month of December, 1923.

CLIMATE

Date	Maximum	Minimum	Average
1st	87·9	75·8	81·85
3rd	87·8	74·1	80·95
4th	87·2	74·8	81·00
5th	87·4	74·8	81·10
6th	87·0	75·0	81·00
7th	87·5	74·9	81·20

At the end of one month, in order to find the average temperature for the month, the last column, 'Average,' is added up and divided by the number of days in the month. After several years, the average temperature for the same month in each year is added up and the average monthly temperature is found. This gives the usual temperature for that month of the year. For example, the temperature of Rangoon for May can be seen from the following :—

Month	Year	Temperature
May	1914	85·0
May	1915	83·5
May	1916	83·5
May	1917	85·0
May	1918	82·2
May	1919	86·0
May	1920	84·4
May	1921	83·8
May	1922	84·4
May	1923	83·2

Thus the usual May temperature for Rangoon is 84·0.

3. Let us now compare the July temperature of several places in North-western India.

Place	Average temperature in July
Peshawar	... 90·9°
Lahore	... 90·3°
Karachi	... 86·2°
Bombay	... 81·1°
Simla	... 64·5°
Srinagar (Kashmir)	... 74·5°

We notice that the coolest places are Simla and Srinagar and the warmest places Peshawar and Lahore.

What happens during the ' Cold Weather ' ?

Place	Average temperature in January
Peshawar	56·3°
Lahore	54·7°
Karachi	65·7°
Bombay	75·2°
Simla	40·4°
Srinagar	33·5°

Here we notice that Simla and Srinagar are again the coolest places, but Bombay is warmer than either Karachi or Lahore.

4. If instead of studying only six places, we considered every place in North-western India where the temperature is kept, we could make two maps of North-western India, each shaded to show the hottest and the coolest places, one map for the temperature in January, and one map for the temperature in July. These maps are drawn in Figs. 15 and 16. Fig. 15 is a map of North-western India shaded to show the actual temperature of places in January, and Fig. 16 is shaded to show the actual temperature in July.

Answer the following questions :—

(1) In which month is North-western India cooler, July or January ?

(2) Which is the warmest part of the country in July ?

(3) Compare both maps with Fig. 7 on page 12. What do you notice ?

5. First of all, look at Fig. 14, January. At this season of the year the sun is shining vertically over the lands

south of the Equator, that is, a long way to the south of India. In January, therefore, the southern part of India is

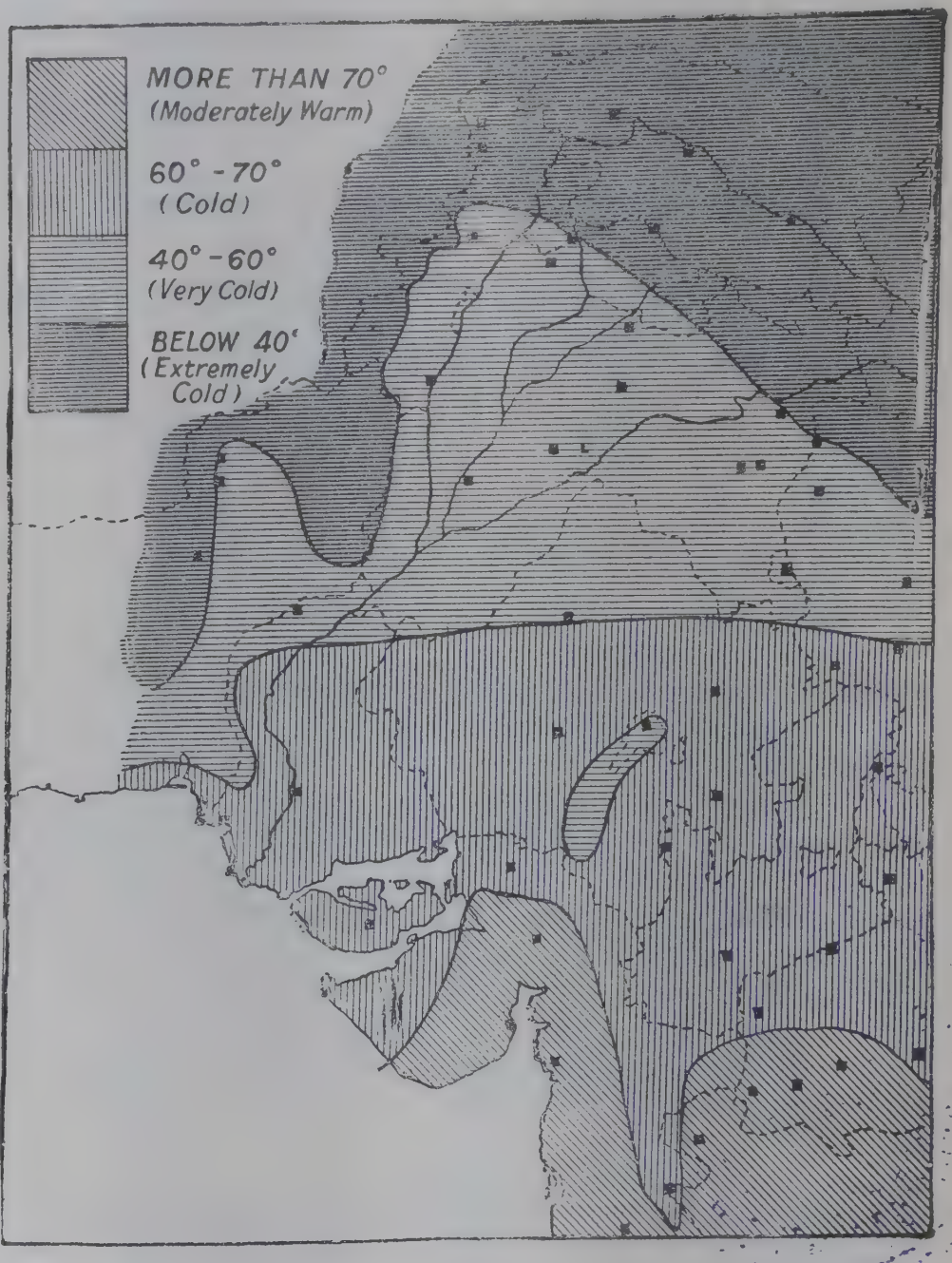
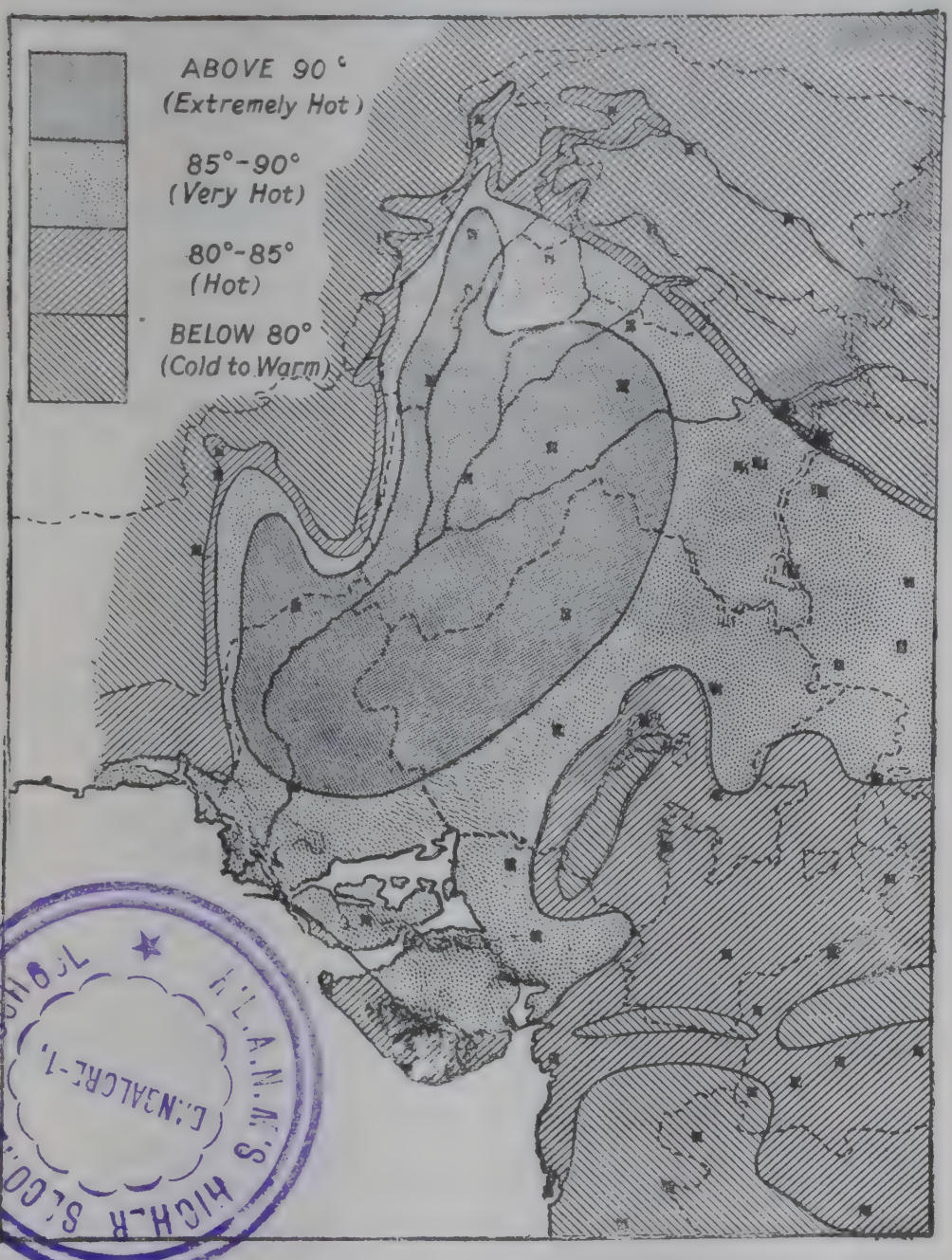


FIG. 14.—Map of North-Western India showing the actual temperatures in January.

warmer than the northern part. Compare this with the January Table in paragraph 3 of this chapter and you will

find that the map and the table agree in what they tell you. Compare it also with what you have read on page 3 in



HIGH SCHOOL
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FIG. 15.—Map showing the actual temperatures in July.

connection with Fig. 3. The north is cooler than the south because (1) the sun's rays are more slanting in the north,

and (2) the north is nearer to the land mass of Central Asia, which gets very cold in winter.

Now look at Fig. 15, July. In July it is quite different. The high mountain wall round the north of our country is still very cold because the temperature always gets less as we go upwards. But if we look at the lowlands, we find that the north of India is now warmer than the south. The sun is shining vertically over the plains of the Indus and the land gets very, very hot indeed. There is a large region where the temperature is more than 90°. This is one of the hottest parts of the world. There are other reasons, which you will learn in a later chapter, why this region should be so very hot.

6. We said just now that the temperature always gets less as we go upwards, so that the tops of mountains and high hills are always very cold. Actually for every 300 feet we mount up a hillside the air gets 1 degree cooler. Now compare Figs. 14 and 15 with Fig. 7 (physical map) or with the physical map of India in your atlas. You will find there are areas marked as colder than the surrounding regions wherever there are hills. Perhaps you are wondering why it should be colder on the mountains than it is on the plains. The mountains are nearer the sun and you might expect them to be warmer. But you must remember that the air is like a blanket keeping the earth warm. A man standing on the sea-shore is like a man under a thick pile of blankets, he has the whole thickness of the air above him. As he climbs up a mountain side there is not so much air *above* him to keep him warm, a great part of it is now *below* him. It will help you to understand this if you look at Fig. 23.

7. The temperature of the air is continually changing. As you know, it is usually hotter in the day than it is at night. In some places it is very much hotter in the day than it is at night. Look again at Fig. 13 (Lahore). You will notice that there the maximum thermometer during the day has been up to 105° and the minimum thermometer during the night has been down to 73°. The difference between the highest and lowest temperatures during one whole day of 24 hours is called the 'Daily Range of Temperature.' In Fig. 13 the range is 105—73 = 32°. This is a very big difference.

Now look at Fig. 16. This is a picture of Thermometers

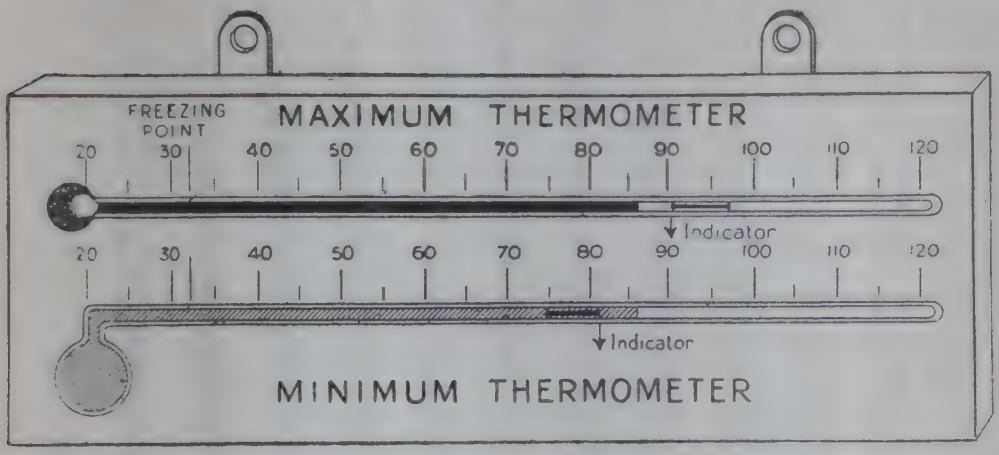

FREEZING POINT
MAXIMUM THERMOMETER
20 30 40 50 60 70 80 90 100 110 120
Indicator
20 30 40 50 60 70 80 90 100 110 120
Indicator
MINIMUM THERMOMETER

FIG. 16.—Picture of Maximum and Minimum Thermometers at Bombay.

at Bombay. The daily range shown is 90° — 81° or only 9°. This is a very small difference. The reason for this you will learn in the next chapter.

8. You have learnt how to find the average temperature for each month. Now let us see how the average temperature varies from month to month. Fig. 17 shows you by a little picture the average temperature in Lahore for each month of the year. You will see that June is the hottest month and January the coldest month. You will also see that in June the thermometer reads 39 degrees (= 93°—54°) more than it does in January. That is, in June in Lahore there are, on an average, 39 degrees more heat than in January. Fig. 18 shows the temperature in Karachi for each month of the year. Again the hottest month is June and the coldest January, but the difference is only 22 degrees.

The difference between the hottest and coldest month is called the ' Yearly or Annual Range of Temperature.'

Now let us look at Bombay (Fig. 19). The hottest month there is May and the coldest January but the difference between the two is only just over 10 degrees.

Before we leave this subject let us go to a place in the mountains. Fig. 20 shows you the monthly temperatures at Simla, over 7,000 feet above the level of the sea. For the whole year Simla is much colder than any of the places on the plains. The hottest month is June and the coldest January with an annual range of 28 degrees.

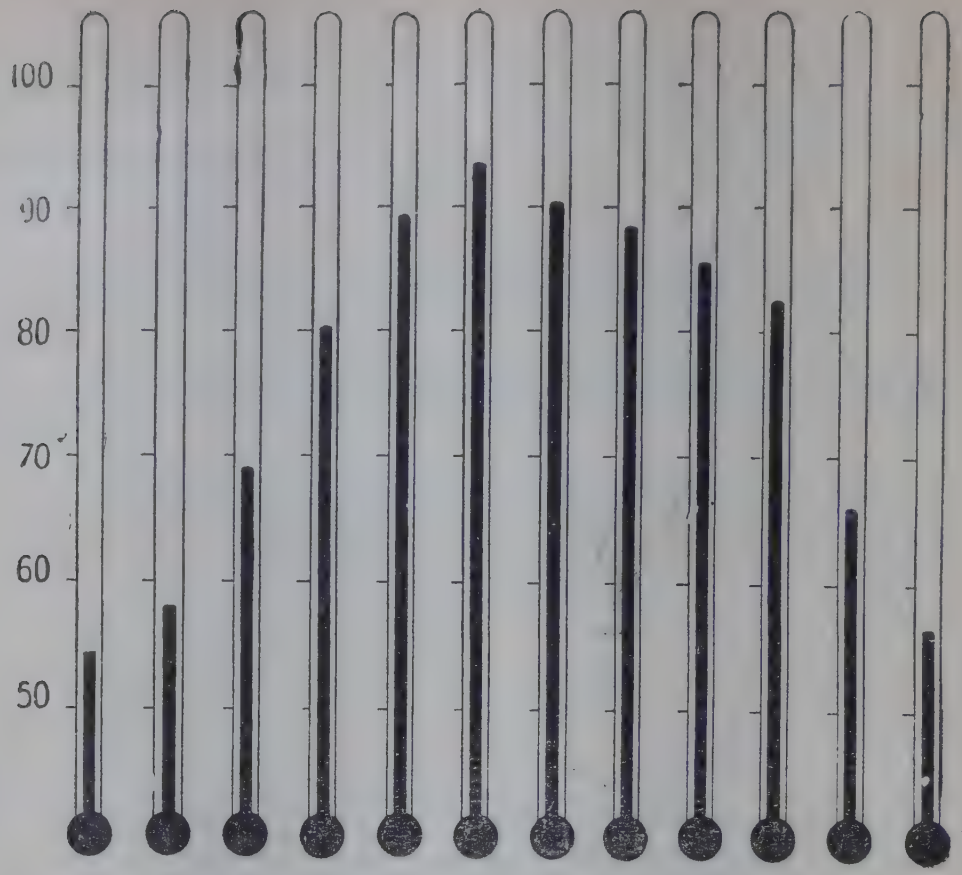


FIG. 17.—Diagram of Lahore Temperature.

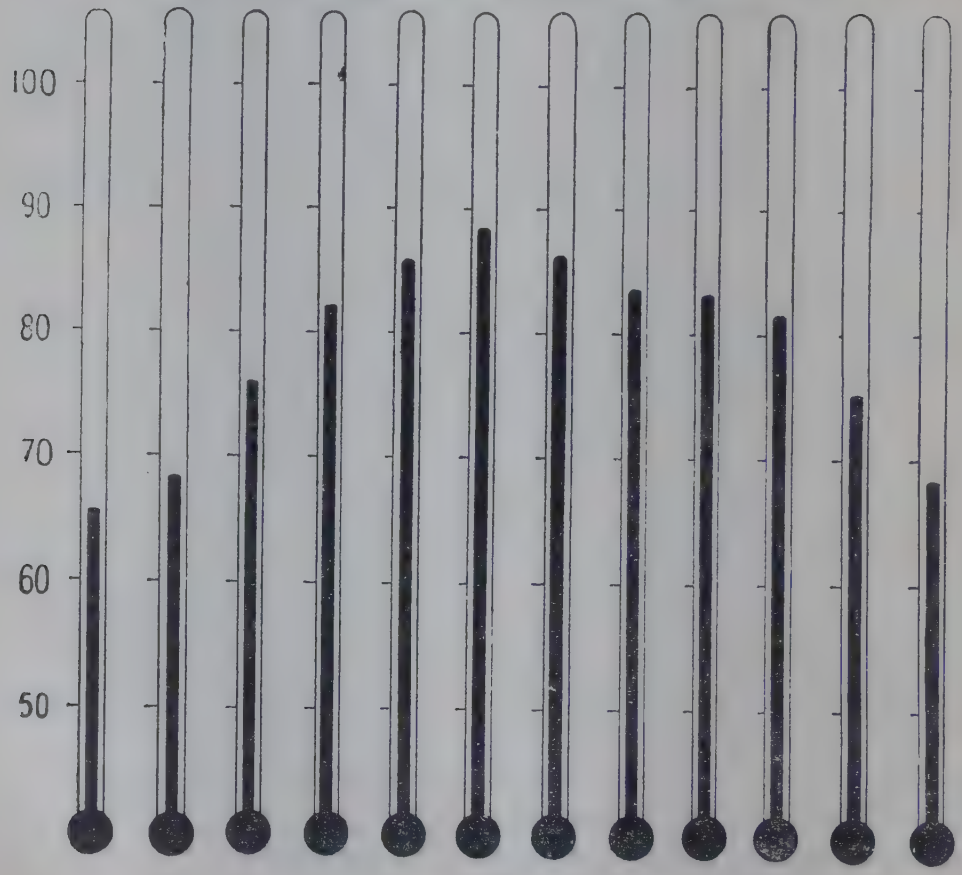


FIG. 18.—Diagram of Karachi Temperature.

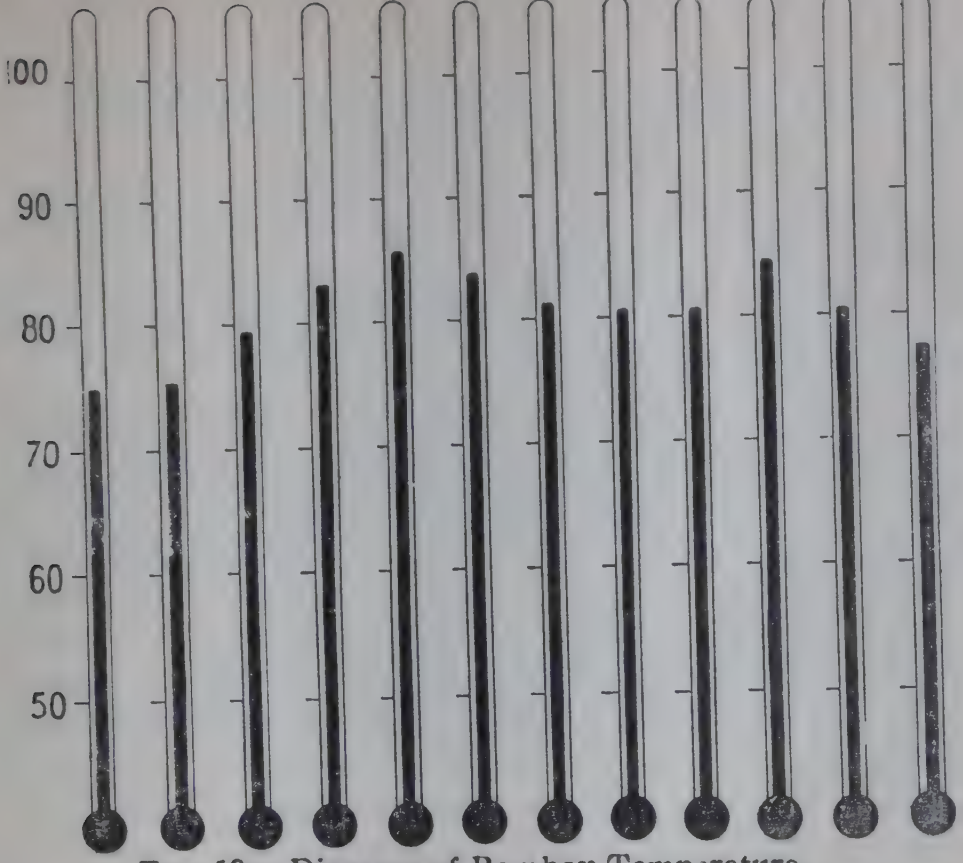


FIG. 19.—Diagram of Bombay Temperature.

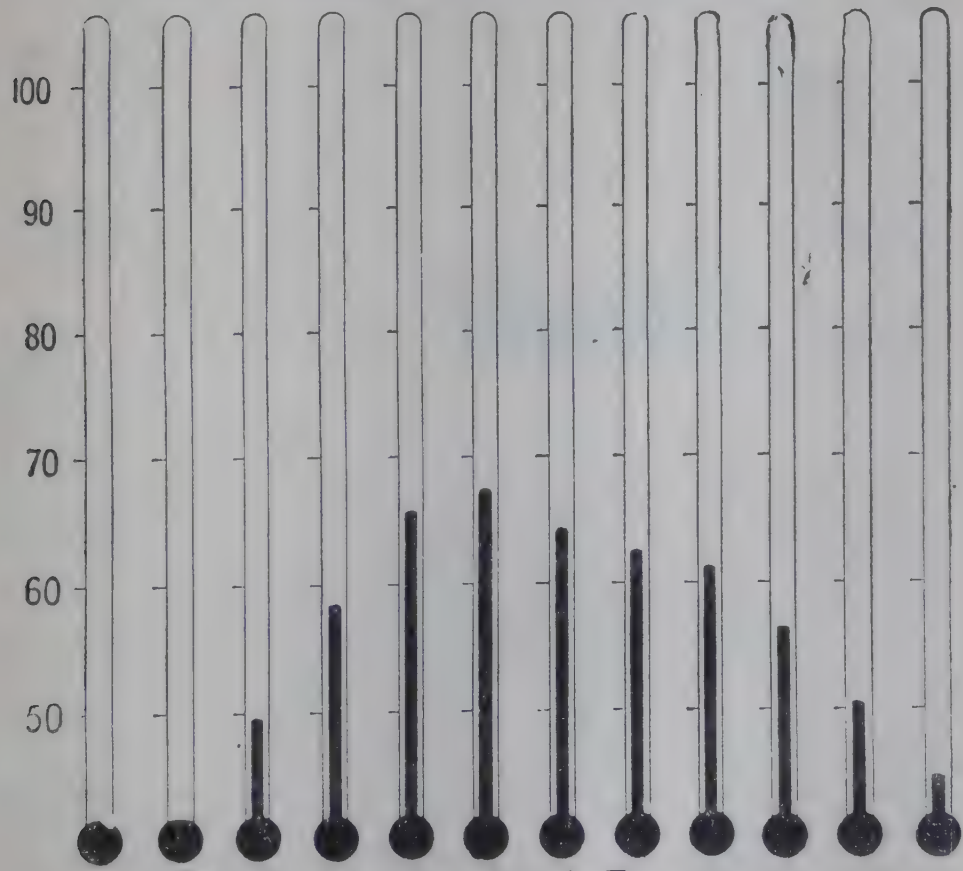


FIG. 20.—Diagram of Simla Temperature.

QUESTIONS AND EXERCISES

1. Draw a picture, showing on the same scale a Centigrade thermometer and a Fahrenheit thermometer.

2. For the 24 hours ending at noon on a day in April, the maximum temperature at Karachi was 91° and the minimum 74°. Draw sketches showing the appearance of the two thermometers when the recording man looked at them.

3. What is the Range of Temperature between January and July at Lahore, Peshawar, Karachi, Bombay, Simla and Srinagar?

4. During the month of January what is the average temperature at Delhi, Hyderabad, Rawalpindi, Gilgit, and Jaipur. (To do this find from your atlas which of the square dots marked on Fig. 14 are these places). What is the average temperature of the same places in July?

5. What is the meaning of the small patch of 'below 80°' shading in Rajputana on Fig. 15? Why is it there?

6. What is the temperature of your own town or village in January? in July? What is the range of temperature between these two months?

CHAPTER V

CLIMATE (2)

1. At places near the sea as, for example, Karachi or Bombay, a strong breeze often blows in the afternoons and dies away in the evenings. It is a breeze from the sea and is very refreshing.

The cause of it is this. The sun shines equally on the land around Karachi or Bombay and on the Arabian sea but the land takes in the sun's heat much more easily than the water does. This you can prove for yourself on a hot day by touching the ground with one hand while you put your other hand into a stream. You will find the land hotter than the water. Therefore the air over the Arabian Sea is cooler than that over the land during the daytime on a

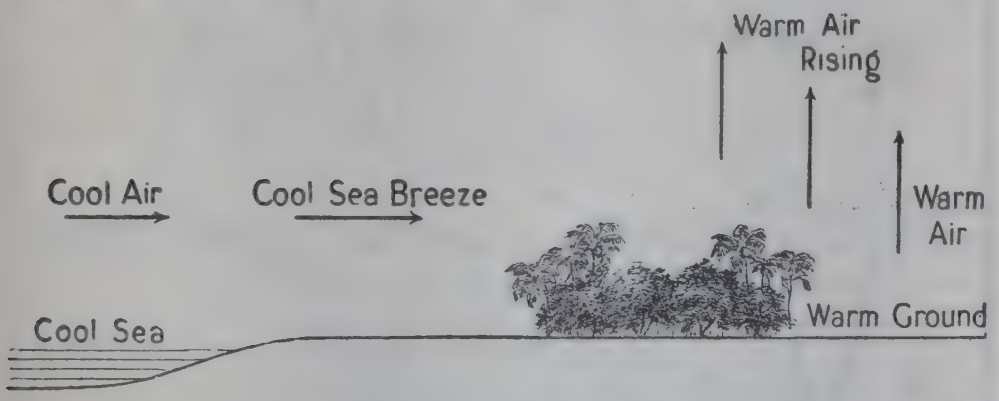


FIG. 21.—Land and Sea Breezes.

hot day. Warm air is light, and cooler air is heavier. Thus the air over the sea, as well as being cooler than the air over the land, is also heavier. Now, if you pour cold water into one end of a tub half full of hot water, it does not stay at the end of the tub, but spreads throughout the hot water. In the same way, the cool heavy air over the Arabian Sea does not stay there. The warm light air over the land rises and the cold heavy air flows in to take its place. This movement of the air is the refreshing breeze which the people of Bombay or Karachi feel. Fig. 21 illustrates this by means of arrows.

After the sun has set, land and sea begin to get cooler but the land loses its heat much more quickly than the water. Soon the land becomes cooler than the sea and the air over the land cooler than that over the water. The warmer air over the water now rises and the cooler, heavier air from the land flows in as a ' land breeze '.

2. The case of Bombay in the hot weather is a small example of what is going on in the huge continent of Asia. In the summer, June to September, the sun shines powerfully over Central Asia, and the land gets very hot, particularly in the North-west of India itself (Punjab), and in the countries to the north. At the same time, the Indian Ocean remains fairly cool. The result is that, like the sea-breeze in Bombay the cooler and heavier air from the Indian Ocean flows from the sea to the land during these months. It does not blow directly inwards, because, as you know,

FIG. 22 —The Monsoon lands of Asia.

the earth is turning round like a top, and this alters the direction. Fig. 22 shows this movement of the air by means of arrows.

This condition lasts from June to October, and the winds that blow from the sea into the interior of Asia are called the

Monsoon winds or Monsoons. In India and Burma they come from the south-west, and so they are called the South-West Monsoons. Now we can realize that, in the matter of the Monsoon winds, our country is a small part of a much larger climate system which includes all South and South-east Asia.

3. Fig. 23 shows that the air high above the hilltops is lighter and thinner than the air at the level of the sea, because the lower layers of air are pressed down by the weight of the layers of air above. Therefore, if the South-West Monsoon meets mountains when it reaches the land, and rises to pass over them, it moves upward into a region

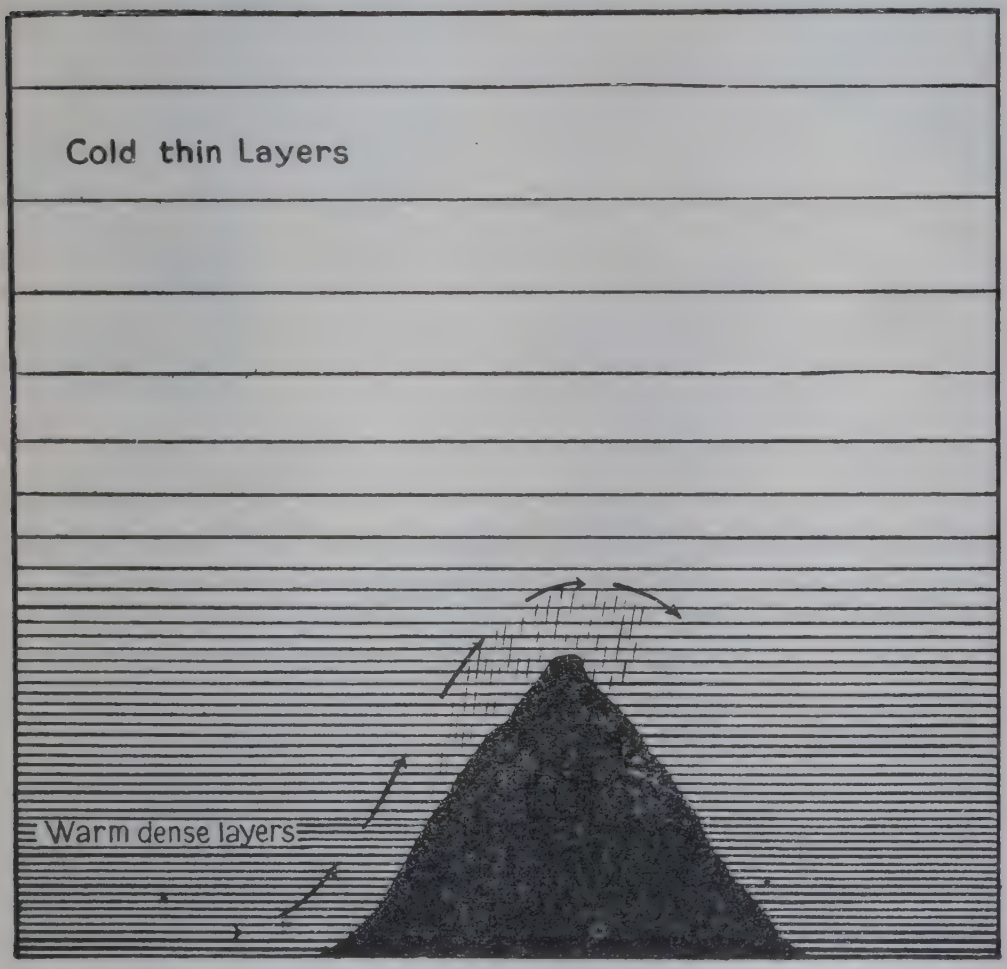


FIG. 23—Showing air rising from a region of warm dense layers to a region of cold thin layers, when crossing a range of hills.

where the air is lighter and thinner. Now, if you open the valve of a bicycle tyre, and let the escaping air blow on to

your hand, it feels cold. This is because the air in the cycle tube, coming out of the valve, has a chance to expand and when air expands, it gets cool. In the same way, when the South-West Monsoon rises to cross the mountains, it also expands and gets cooler. Cool air cannot carry as much moisture as warm air, and so the South-West Monsoon has to drop some of the moisture it carries, and this falls as rain.

This is what happens when the Monsoon meets the Himalaya Mountains, and the result is the heavy rainfall which is shown in Fig. 29. It also explains the heavy rainfall on the mountains (Western Ghats) to the east of Bombay. You will learn more about this in the next chapter.

4. The Monsoon does not blow from the south-west in every place in India. The following table shows the direction of the Monsoon in the places named :—

Place	Direction of Monsoon
Bombay	... S.W.
Surat	... S.W.
Karachi	... S.W.
Delhi	... S.E.
Lahore	... E.
Srinagar	... N.W.
Peshawar	... N.E.
Manwali	... E.S.E.
Ambala	... E.S.E.

If these directions are shown on a map of the mountains of India, the explanation of the differences becomes clear.

Examine Fig. 24. It is clear that the direction of the monsoon wind depends on the direction of the mountain ranges and the river valleys. Remember too that the wind is being sucked in or drawn towards the great hot, dry area of the Punjab plains. The arrows near the coast—at Bombay, Surat and Karachi—show the normal direction —from the south-west. The long arrows on Fig. 24 mean that the wind direction during the Rainy Season is constant —short arrows mean that it varies. Notice that nearly everywhere the wind blows parallel to the length of the mountains and highland, that is, it blows along the valleys. It is easier for the wind, just as it is for men, to travel along valleys than to cross hills. Look for a moment at the arrows near Delhi, and Ambala. Why should the wind

be blowing there from the south-east? It is because the great current of air has come up the Ganges Valley, from

FIG. 24.—Map of North-Western India showing Monsoon arrows.

the Bay of Bengal, blowing parallel to the great mountain wall of the Himalayas.

5. We have already learnt in Chapter II that parts of North-west India lie outside the great mountain wall. The two parts that do are the northern part of Kashmir (forming part of the Plateau of Tibet) and Baluchistan. The South-West Monsoon winds are not felt in these countries, the

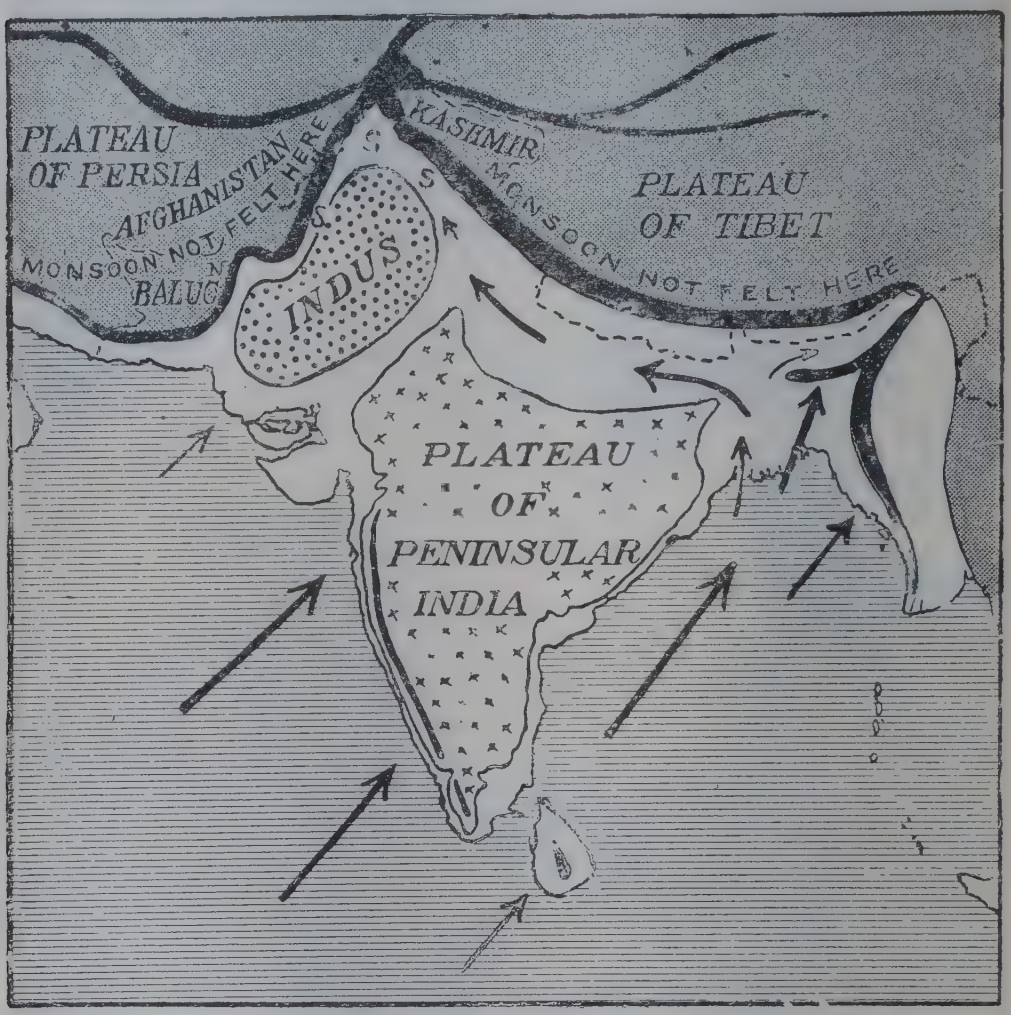


FIG. 25.—The Monsoon Regions of India. S=Monsoon only slightly felt.

wind does not cross the great mountain wall. Fig. 25 shows you clearly those parts of India, which are outside the influence of the monsoon.

Up to the present we have been talking about the South-West Monsoon which blows from June to September and is the rain bearing wind. Before we consider what happens in the Dry Season let us go back to the local breezes

which blow on the sea-shore. We have learnt that during the day time a cool breeze, called a Sea Breeze blows from the sea to the land. In the evening when the sun sets the land and the water begin to get cool, but the land gets cool much more quickly than the sea. And so during the night the air over the cold land is cold, whilst the air over the sea is warmer. So the warmer air over the sea rises and the cooler air from the land flows in to take its place, forming a land breeze. By day, then, there is a sea breeze and by night a land breeze.

Do you remember that in the last chapter we found that the daily range of temperature of places like Bombay near the sea is very small? We can now say why that is so. The cool sea breezes by day keep the temperature low whilst the presence of warm air over the sea at night prevents the nights from being very cold. Places near the sea usually have an equable climate, as we say, and the ranges of temperature are only small.

6. We must now consider what happens during the Dry Season. At that time of the year the sun is shining vertically south of the equator, and the great land mass of Asia gets very cold. The cold air blows down from the north towards the equator to take the place of the warm light air there. The rotation of the earth changes its normal direction from north to south-east, and in North-western India it usually blows from the north-east but in some places follows the lines of the valleys just as the South-West Monsoon does, and so its direction is more often nearly west in the Ganges Valley. This wind comes from a colder region and so is cool, but it blows from a land mass and so does not carry any moisture. It is then a dry wind and brings no rain. This wind is sometimes called the North-East Monsoon, but it is really the same as the North-East-Trade Wind which blows in the northern tropics in other parts of the world.

QUESTIONS AND EXERCISES

1. What do you think is the normal direction of the Monsoon winds during the Rainy Season at Rawalpindi, Ferozepore, Simla, Ahmadabad, Ajmer, Jaipur and Sukkur? Draw sketches to show your reasons. Find all these places in your atlas.

2. What do you think is the direction of the wind during the Dry Season at Karachi, Bombay, Peshawar, Lahore, Delhi, Jaipur and Bombay?

CHAPTER VI

CLIMATE (3)

1. The most important thing we have to consider in connection with the climate of India is the amount of rain that falls in the country. We divide the year into 'Rainy Season' and 'Dry Season,' and the cultivators depend upon the rainfall to give them good crops. Just as the temperature is carefully measured every day at certain places in India, by men who are in charge of the thermometers, so also, these same men have to measure every day how much rain falls.

To do this, each man is given an instrument called a 'rain gauge.' Fig. 26 is a picture of one, and if you go to the nearest Government hospital and ask the doctor in charge, he will doubtless show you the real one which he examines every day.

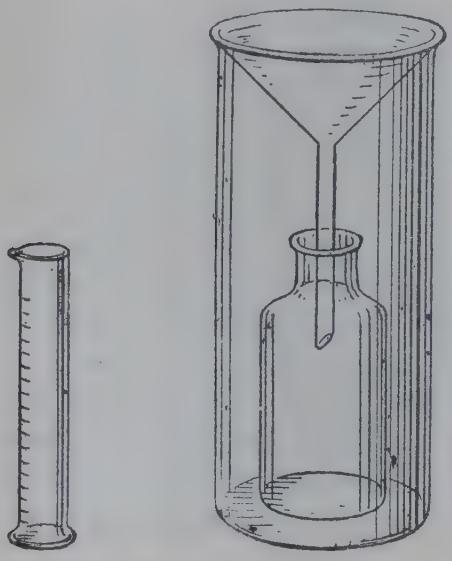


FIG. 26.—A rain gauge.

The raindrops fall into the mouth of the jar, and run down the funnel into the bottle inside. As the bottle is inside the jar, the rain collected in it does not dry up, as the rain which falls on the ground 'dries up.' Every day the jar is opened and the bottle taken out. Then the rain-water in the bottle is poured into a glass which has divisions marked on it. Suppose that on a certain day the rain-water from the bottle fills the glass up to the 1·5 mark. This will mean that if all the rain which fell on the ground in that town or village had stayed still on the top of the ground, and had not run away in chaungs, or soaked into the ground, or disappeared when the sun shone again, it would have been 1·5 inch deep. In other words, 1·5 inch of rain fell in that place.

The man in charge of the rain gauge then enters into his book the date, and writes against it, 1·5 inch of rain. At the end of the month he adds up the total number of inches of rain that have fallen during that month, and he, and all the other men who have had charge of rain gauges, send the records to the principal town of the province (Peshawar, Lahore, Bombay, etc.) where they are carefully printed and kept. Notice very carefully that to get the rainfall for the month we add the daily totals. To get the average temperature we add the daily total and divide by the number of days. This is a very important difference. Note the difference in obtaining the monthly rainfall and the monthly temperature very carefully.

2. The following figures are copied from the records of Jaipur for a certain year :—

JAIPUR

Month	...	January	February	March	April	May	June
Rain	...	0·39 in.	0·29 in.	0·36 in.	0·20 in.	0·57 in.	2·59 in.
Month	...	July	August	September	October	November	December
Rain	...	8·35 in.	7·11 in.	3·06 in.	0·24 in.	0·13 in.	0·32 in.

Notice in which month there was most rain, and in which month there was least rain. In order to show you very clearly the months in which most rain falls in Jaipur, the figures above has been drawn in a diagram, Fig. 27.

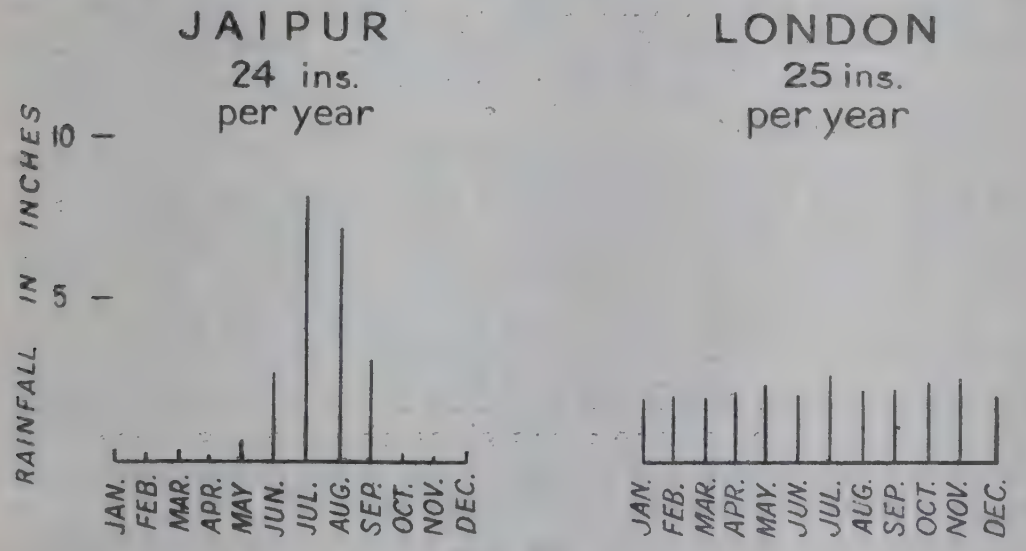


FIG. 27.

Fig. 27 also gives a diagram showing the rainfall in the different months of the year in London. You will see that

London gets about the same amount of rain as Jaipur, but that Jaipur gets much rain in some months and very little in other months. London gets almost the same amount of rain every month in the year. This is because Jaipur is in India, which is a 'Monsoon' country, and London in England, which is a 'rain throughout the year' country.

We will now examine the records of several places in North-western India and see what we can learn from them about the rainfall of the country. Look at the following table :—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Normal total of a year
Delhi ...	0·84	0·59	0·47	0·27	0·64	2·48	7·64	6·62	4·76	0·18	0·10	0·33	25·22
Lahore ...	0·95	1·01	0·80	0·45	0·66	1·51	4·91	4·49	2·33	0·28	0·08	0·39	17·86
Peshawar ...	1·55	1·29	1·97	1·74	0·78	0·32	1·27	1·86	0·81	0·19	0·43	0·51	12·72
Simla ...	2·50	2·76	2·75	2·17	2·64	6·95	16·54	18·03	5·78	0·87	0·51	1·66	62·56
Karachi ...	0·56	0·50	0·36	0·18	0·07	1·01	3·01	1·25	0·45	0·01	0·15	0·14	7·69
Baroda ...	0·03	0·12	0·06	0·01	0·18	5·34	13·90	9·29	5·56	0·59	0·10	0·05	35·43
Bombay ...	0·06	0·03	0·05	0·02	0·45	21·13	27·85	15·68	12·06	1·96	0·39	0·06	79·74

The figures beneath the word 'Total' show how much rain fell in the whole year. You can see quite plainly that the places in this list which have the heaviest rainfall are Bombay and Simla, and that the places which have the least rainfall are Karachi and Peshawar. Baroda has quite a good rainfall. Fig. 28 shows you this still more clearly by means of lines.

3. If these seven towns were the only places in North-western India where rain gauges were kept, we might say there are three divisions in our part of India, the 'heavy rain' division, the 'moderate rain' division, and 'very little rain' division. But there are many more places than these seven towns in North-western India where rain gauges are kept, and if we examine all their records, taking the 'average' for all the years since the records were first kept, we can mark on a map of the country the annual or yearly rainfall for each place where there is a rain gauge. Then we can draw lines on the map joining all places which have the same rainfall. There will be a line of 40 in. of rain, one of 50, another of 60, and so on. Then we can make our map still more clear using different kinds

of shading. We may use one kind of shading to cover all places having between 40 and 60 inches of rain per year, another kind for places receiving between 60 and 80 inches. Such a map is called a Rainfall Map. As we all know, most of the rain falls in one part of the year in our part of India, in the 'Rainy Season,' and very little falls during the rest of the year. Because of this, we could have two rainfall maps of North-western India, one for the rainy season, June to September, and one for the dry season, October to May.

4. For most purposes it is more important to know the amount of rain which falls during the whole of the year. So in Fig. 29 you have a rainfall map of North-western India for the whole year. Notice that most rain falls on the coast near Bombay and the slopes of the Himalaya Mountains, whilst least rain—less than 5 inches a year—falls in the middle part of the Indus Plains, that is, in the South-west Punjab.

Except in Northern Kashmir and Baluchistan, which, as we learnt in the last chapter, are out of the reach of the Monsoon winds, it is only necessary

FIG. 28.—Rainfall Graphs of Towns.

for us to remember that most of this rain falls during the rainy season, from May to October.

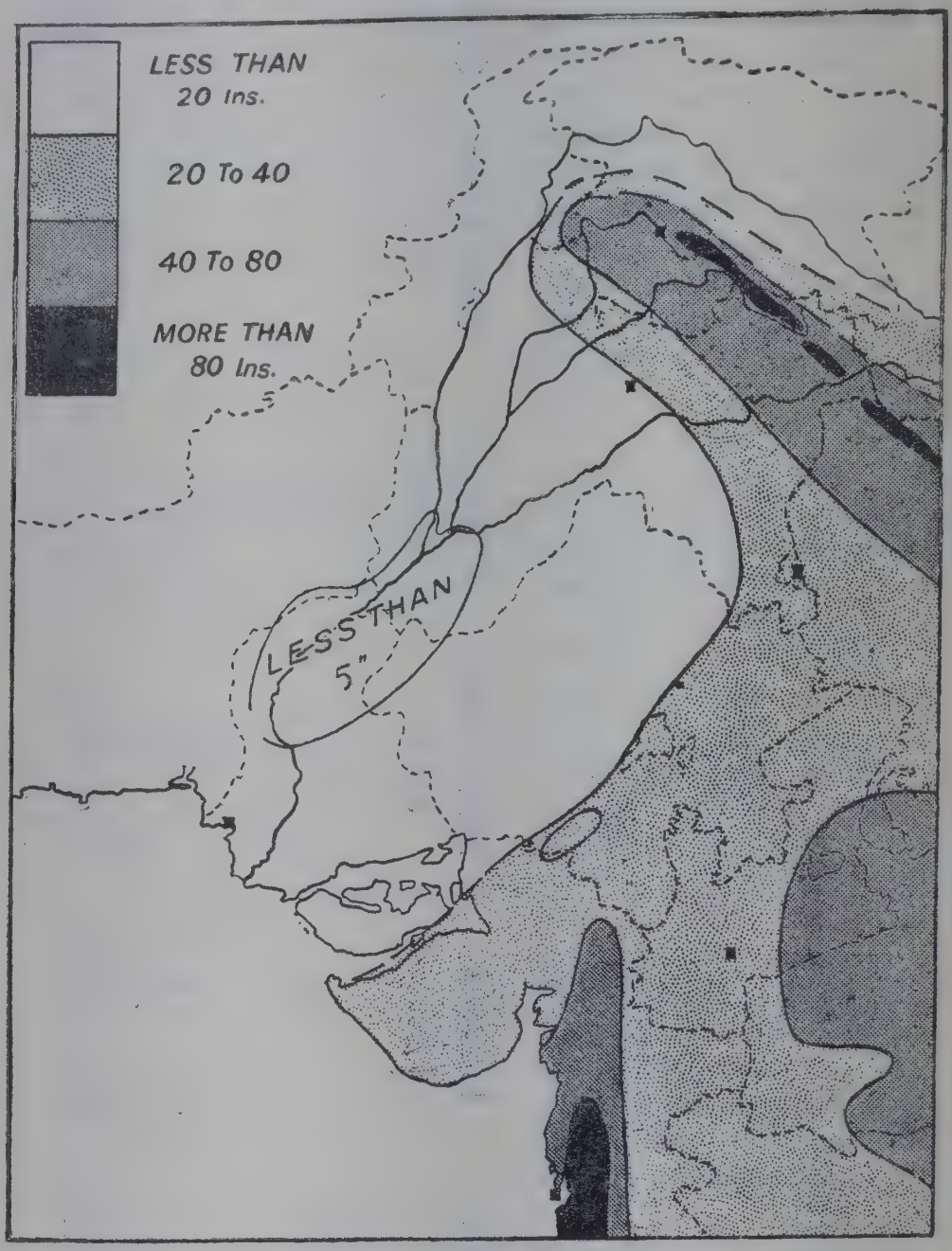


FIG. 29.—Rainfall Map of North-Western India for the year.

Study Fig. 29 very carefully. Notice that it has marked on it only three rainfall lines, the lines 20 inches, 40 inches and 80 inches. A small area with less than 5 inches is also

shown. These lines divide our part of India into five parts.

(*a*) Almost rainless division with less than 5 inches. It is impossible to grow crops here except where water can be obtained from rivers.

(*b*) Very poor rainfall division with from 5 to 20 inches. Where the rainfall is less than 20 inches, as in the South-west Punjab, it is almost impossible to grow any crops without irrigation. If the land cannot be irrigated, it is desert like the Great Indian Desert. In Chapter IV we found out that this poor rainfall area differs from the other regions in temperature. It is the area which gets very hot in summer and towards which the monsoon winds blow in the summer months.

(*c*) Poor rainfall division with from 20 to 40 inches of rain in a year. Here as you will learn later, the Dry Belt crops such as millet, wheat, barley and cotton grow, rice can only be grown where water is to be obtained from the irrigation canals made by Government and other crops, too, only grow well where the land is irrigated.

(*d*) Moderate rainfall division which has between 40 and 80 inches of rainfall. In the hilly regions pine forests grow with this rainfall and on the plains there is a mixture of Dry Zone and Wet Zone crops. Excellent forests of monsoon trees flourish with this rainfall.

(*e*) Good rainfall division which has more than 80 inches of rainfall. In the plains rice is everywhere the most important crop and the hills are covered with thick evergreen forest or jungle.

5. When a wind crosses the sea, it picks up a great deal of water. We cannot see the water in the air because the water has been changed into an invisible gas called water vapour. The changing of water into water vapour is called evaporation. Hot air can hold more water vapour or more moisture than cold air. If warm air which is full of water vapour is cooled, the water vapour changes back into water and falls to the earth as rain. The change from water vapour into water is called condensation.

Now there are two principal ways in which air or wind can be cooled and made to give up its moisture. One is when the wind is blowing to a colder place and so is cooled, the other is when the wind meets a range of mountains

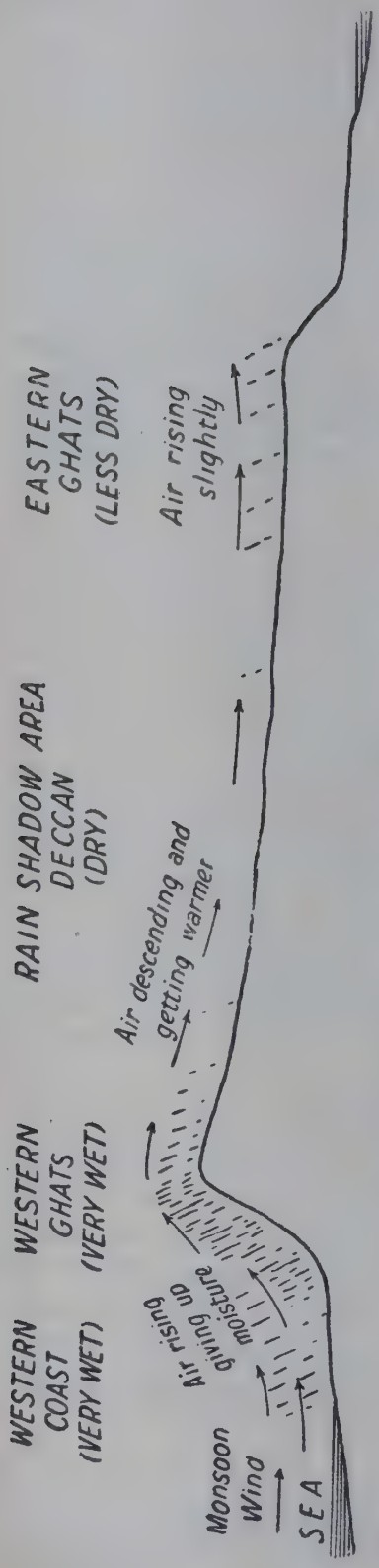


FIG. 30.—Section across the Western Ghats showing rain-shadow.

and is forced to ascend in the cooler upper part of the air.

In the last chapter we learnt that the South-West Monsoon blows from the sea towards the land. It is, therefore, a wind full of water vapour. Let us look at the neighbourhood of Bombay. The wind there, full of moisture, blows from the south-west and we see that it must cross the Western Ghats before reaching the Deccan. The warm moist air rising gives up most of its moisture and so Bombay and the slopes of the Western Ghats facing the wind have a very heavy rainfall.

Now look at Fig. 30 and see what happens when the wind has crossed the Western Ghats. It begins to descend gradually. Looking at Fig. 23 again, we see that this means that it is going down into heavier and denser layers of air and is therefore itself compressed. When air is compressed it becomes warmer as you know from the fact that when pumping up a bicycle tyre the pump gets warm. Warm air can contain a great deal of moisture. Therefore the monsoon gives up little of the moisture it carries and there is little rainfall.

When light falls on an object, a shadow is formed on the opposite side of the object. In the same way, when rain falls on one side of a hill, there is a 'shadow' of dryness on the other side. The

dry area is called the 'Rain Shadow'. The Deccan is thus in the rain shadow of the Western Ghats. There are many other examples of rain shadows in the world besides this one. The centre of Burma is in the rain shadow of the Arakan Yoma. The East Coast of England is in the rain shadow of the Pennine Range. Look these up in your atlas, and others.

6. We must now try and explain why the Punjab plains receive so little rain. As you learnt in Chapter IV the sun is shining vertically over this region in June and July and the land gets very hot. The air also gets hot and rises and the cool wind of the South-West Monsoon blows in to take its place. But the monsoon wind is blowing towards a warm region and so is not cooled but is warmed. Instead of giving up the moisture it has, it gets warmer and is ready to take up more. Moreover you must remember that the monsoon wind, before it reaches the Punjab has travelled a long way—perhaps right up the Ganges Valley and has lost most of its moisture on the way. There are no ranges of hills to cause a heavy rainfall. But notice from Fig. 29 what happens when the monsoon wind strikes the Himalaya Mountains.

7. We have now discovered the answer to the question 'Why is there so little rain in the Punjab?' But we have still to find out 'Why is the Punjab so much hotter than the rest of India in the hot season?'.

Two reasons we know already—one that the sun is shining almost vertically over this region in May, June and July. Another is that the Punjab plains are far from the sea, which we have learnt, helps to keep the land cool in the hot season and warm in the cold season. Another reason is this: there can be no rain without clouds, therefore, in the wetter parts of India, the sky is generally covered with cloud in the wet season and just before and after it. Because of this the sun does not shine directly on the ground and this helps to keep it cooler than the ground in the Punjab. In the Punjab there are few clouds and brilliant direct sunshine reaches the ground.

QUESTIONS AND EXERCISES

1. Explain the causes of the rainfall at Simla (62·56 inches) Mt. Abu (60·20 inches) and Sukkur (3·10 inches).

2. Explain why the rain falls on the windward side of hills.

3. Look up Table II at the end of this book. Express these figures as diagrams. Compare them with the temperature diagrams of the same places. Write down all that you notice.

4. Using the figures shown on page 46, draw rainfall graphs for the towns of Karachi and Baroda. What are the driest and rainiest months in each case.

5. Compare Fig. 29 with Fig. 70, and then say what parts of North-western India are in the 'Poor Rainfall division' (less than 40 inches), what parts are in the 'Moderate Rainfall division' and the 'Good Rainfall division'. What is roughly the rainfall of your own home?

6. Explain exactly how you can obtain the 'Average Temperature' of the month (say the month of June) and exactly how you obtain the average rainfall for the same month. Explain why the method is different.

CHAPTER VII

VEGETATION

1. Different races of mankind live in different ways. Some men are chiefly hunters, like the Red Indians of America, some are cattle-keepers, like the Zulus of South Africa, others depend upon fishing, like the Esquimaux, and so on. The way in which men live depends chiefly on the plants which will grow in the lands in which they live. Plants require water, and plenty of it, so that in very wet countries there will be thick forest and jungle. In the drier lands there will be grass or shrubs with trees here and there. In the lands where there is no rain nothing will grow, and the place will be a desert.

Man does not depend only on the plants that will grow by themselves. After thousands and thousands of years man has learned to grow things purposely in fields and plantations which he himself has made. The people of the jungle lands were chiefly hunters at first, as the Pygmies of the African Forest and the wild tribes of the Amazon Forest are to-day. But later on, they learned to clear away the trees in suitable patches in the jungle, and could cultivate a few crops, as do the Chins of Burma. At last, in some of the hot wet lands, we find men refusing to let the jungle grow over huge areas, and in the place where it would be they cultivate hundreds of square miles of fields of rice. In temperate lands, as in Canada and Europe, men have removed the trees of the forests and grow grain suitable to that climate. Similarly in the grass lands the people are naturally cattle-keepers, but they, too, plough up the grass and in its place cultivate those plants which they require—wheat, for example, in the prairies of Canada.

2. Now suppose there had been no human beings at all in India. What would be the appearance of the country? Instead of wheat fields there would be just jungle or waste land, there would be no villages with palms and trees.

The country would be covered with the sort of forest and jungle which can be seen at present where men have not interfered with it very much. Plants which grow by themselves form the natural vegetation of the country. Therefore, if man had not lived in India, it would be covered with its natural vegetation. In some parts of India, there are few villages, and man has not altered the natural vegetation very much; but in places like the fertile rich alluvial lands he has changed it a great deal. The natural vegetation of a country depends mainly on the rainfall, the heavier the rainfall the thicker the natural vegetation will be.

If we study Fig. 31 we can tell what the natural vegetation of North-western India consists of. In the rainier parts there is forest; in the driest parts there is land which is almost, but not quite, desert. On highlands like the Baluchistan Plateau which have very little rainfall there is again desert.

From this we know that rainfall is the most important cause of differences in natural vegetation; but there is another important cause, and that is the height of the land above sea level. Above 3,000 ft., there is always a great change. For example, the deodar and the pine trees do not grow below 3,000 feet and below there is just scrub forest.

Let us now consider the different types of natural vegetation.

(*a*) *Evergreen Forest.*—When the rainfall is more than 80 inches (see Fig. 29) the forest is green all the year round. There are many different kinds of trees, often they are of very large size, but their wood is generally very hard, and up to the present these forests have not been much used commercially. It is only in the extreme south of the area we are studying near Bombay that we find these forests.

(*b*) *Monsoon Forest.*—Where the yearly rainfall is more than 40 inches but less than 80 inches the natural vegetation consists of Monsoon Forest. The trees of the monsoon forests lose their leaves in the dry season to protect them against the great heat. In our part of India forests of this sort are found on the damper parts of the plateau of Peninsular India where the teak tree is an important one and also on the lower slopes of the Himalayas up to 3,000

or 5,000 feet (Sub-Himalayan Region). The western end of the Himalayas are, however, rather too dry and the forests are only poor and the most important product is bamboo.

(*c*) *Scrubland.*—Where the rainfall is less than 30 or 40 inches a year it is too dry for forests to grow properly. A few trees grow but most of them are armed with spines or thorns to prevent them being eaten by animals. Sometimes these small thorny trees form forests but more often the trees are really only small bushes and are far apart. We call such land 'Scrubland.' Notice from Fig. 31 that Scrubland covers the dry hills of the North-west and the slopes of the plateau of Peninsular India. Not much is left in the plains, except in the Bar tracts, between the Sutlej and Jhelum.

(*d*) *Desert and Semi-Desert.*—As the rainfall gets less so the vegetation becomes poorer and poorer. Trees and even bushes disappear and nothing remains but a few thick fleshy plants separated by large stretches of sand or bare rock. Desert covers the greater part of Baluchistan and you will learn in a later chapter of the few fertile oases where cultivation is possible. A great part of Rajputana is also desert (The Great Indian Desert).

(*e*) *Mountain Forests.*—On the Himalaya Mountains between 3,000 and 12,000 feet we find forests which are very similar to those found in Temperate lands. You have learnt that as you climb a mountain it gets colder and colder. So the temperature gets lower and lower and between 3,000 and 12,000 feet on the Himalayas it is the same as in Temperate lands and we find forests which we can call 'Temperate Forests' or 'Mountain Forests.' These temperate mountain forests are evergreen, that is the trees keep their leaves for the whole year, but they are quite different from the Wet Evergreen Forests of the lowlands which we mentioned above. There are two chief kinds of forest, one of trees with broad leaves (Oak Forests) and another in which the trees have needle-like leaves (Coniferous Forests). Typical trees in the Coniferous Forests are the *chir* or *chil* pine, the deodar and the *kail* or blue pine. These trees yield good soft wood as well as turpentine and resin and where they can be easily reached they are very valuable.

(*f*) *Alpine Vegetation.*—Above 11,000 feet on the Himalayas it is too cold for trees to grow. Above this level we find only small bushes and perhaps short grass.

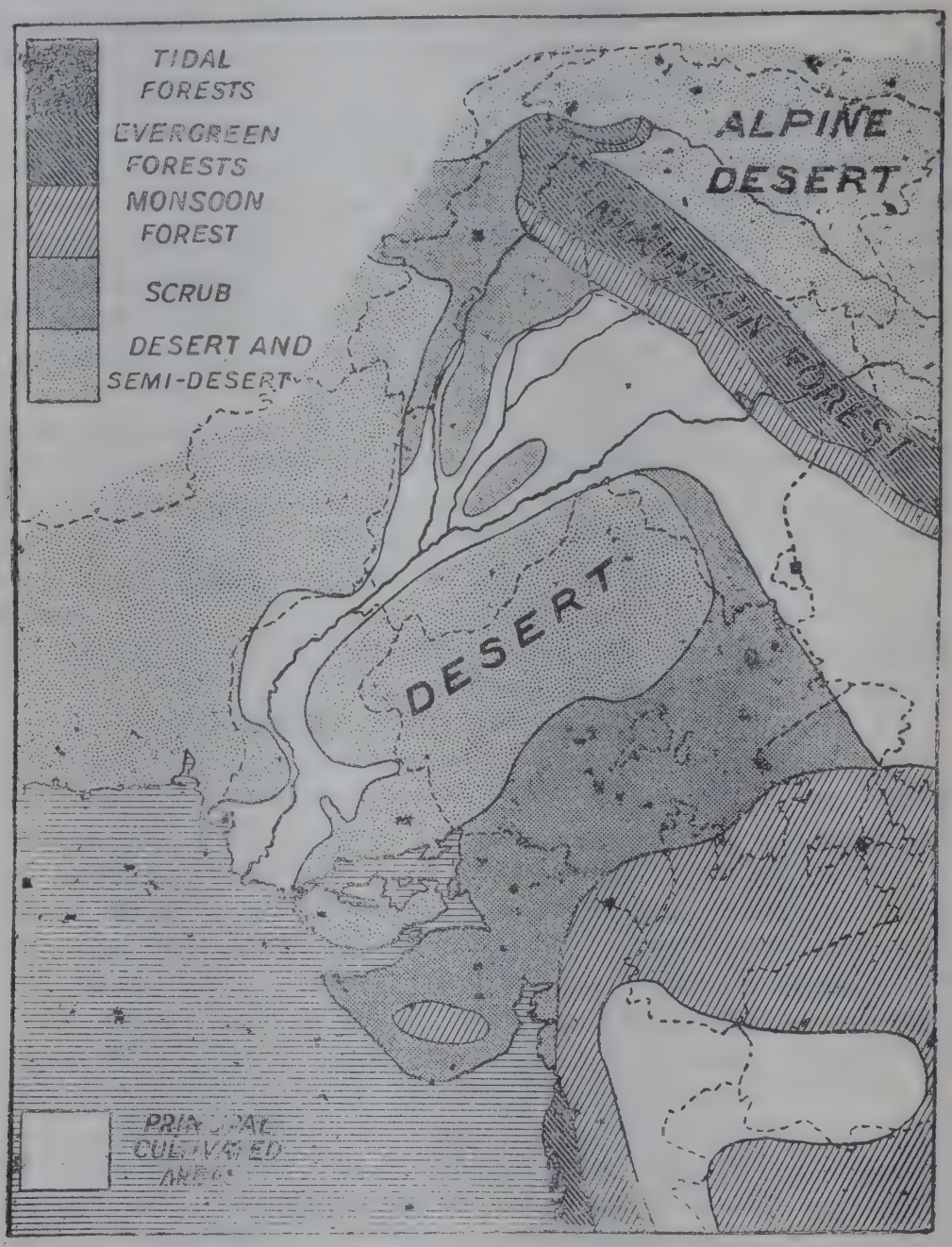


FIG. 31.—The Natural Vegetation of North-Western India.

This is called 'Alpine Vegetation.' At 16,000 feet we reach the 'Snow Line' above which there is always snow.

On the great Tibetan Plateau, there is very little moisture and even small bushes have a great trouble to live. There are large stretches of barren rock, broken by numbers of salt lakes. This barren waste, covered by snow in winter, is really a desert and is marked on Fig. 31 as 'Alpine Desert.' Notice how it differs from the hot deserts of the plains.

3. The plants which men grow purposely in fields and plantations are called the 'artificial vegetation' of a country. Now Fig. 31 is a true map except for those parts of the country where villages and towns are thickest; in these places, man has cut down the 'natural vegetation', and in its place he has cultivated 'artificial vegetation', i.e., crops of his own, and as fast as the 'natural vegetation' tries to grow, in the form of weeds, he cuts it down and clears it away. Over large areas in the Punjab Plains there is no natural vegetation left at all. But man cannot grow exactly what he wishes, for 'artificial vegetation' is just as dependent on rainfall as is 'natural vegetation'. Roughly, the cultivated crops in India can be divided according to the rainfall or water supply of the regions in which they grow:—

(*a*) Dry Crops which depend on rainfall for their growth.

(*b*) Irrigated Crops which depend on an artificial supply for their growth, or grow in the wettest part of the region under study.

(*c*) Mountain Crops.

(*a*) *Dry Crops.*—The chief of these are millets (*bajra* and *jowar*) others are gram, native cottons, wheat and barley.

(*b*) *Irrigated Crops.*—The wealth of the great Punjab Plains depends largely on the crops grown on irrigated land and the prosperity of this part of India has increased enormously under British administration. Amongst the most important crops are wheat, barley, cotton and fodder.

(*c*) *Mountain Crops.*—The most important is maize, with some wheat and barley on hill slopes and rice in the narrow pieces of flat land in the valleys.

4. An 'acre' of land is about half the size of an ordinary football field, marked out according to the rules of football. In all the area we are studying there are about 80,000,000 acres of cultivated land. That is, if all the cultivated land

were given up to football, there would be about 40,000,000 football fields and every two people could have a football field of cultivated land to themselves. Since so much ground is given up to cultivation you can understand why our country is called an agricultural country.

We will now take a few of the more important crops and see where they are grown.

(*a*) *Rice.*—In many parts of India rice is by far the most important crop and forms the principal food, or as we say the 'staple' food of the people. Rice requires considerable heat from the sun, and a great deal of moisture. The young plants have to grow under water and so rice is grown in flat fields which are flooded in the rains. So we find rice in India where there is flat land and where the rainfall is very heavy. In the north-western part of India there is not usually enough rain for rice but it can also be grown in irrigated land where the fields are flooded by water brought from wells or from the rivers. Look at Fig. 32. Each dot on that map represents 50,000 acres of rice. You will see that it is grown in the irrigated lands of the Punjab Plains, the Lower Indus Valleys and in the very rainy country near Bombay. But rice is not very important in our part of India.

(*b*) *Millet.*—Millet is a small grain which forms the staple food of the people in most of the drier parts of India. There are several different kinds, the two principal being cholum or *jowar* and cumbu or *bajra*. Where the rainfall is less than 40 inches millet is everywhere important, but where the rainfall exceeds 40 inches it quickly disappears. Millet is in the main a 'Dry Crop' and does not require irrigation. Look at Fig. 33 and notice that millet is important in the Dry Hills of the North-west, and in the South-east of the Punjab but not in the richly irrigated parts of the Punjab where better grains can be grown. In all the drier parts of the great plateau of Peninsular India it is very important.

(*c*) *Wheat.*—Wheat is a grain which is very much valued by white races and forms their principal food. Many parts of the world now grow wheat and send it to Europe to feed the enormous number of people engaged in industry there. Wheat in India is a winter crop. It is sown at the end of the rains and ripens before the great heat of the Hot Season

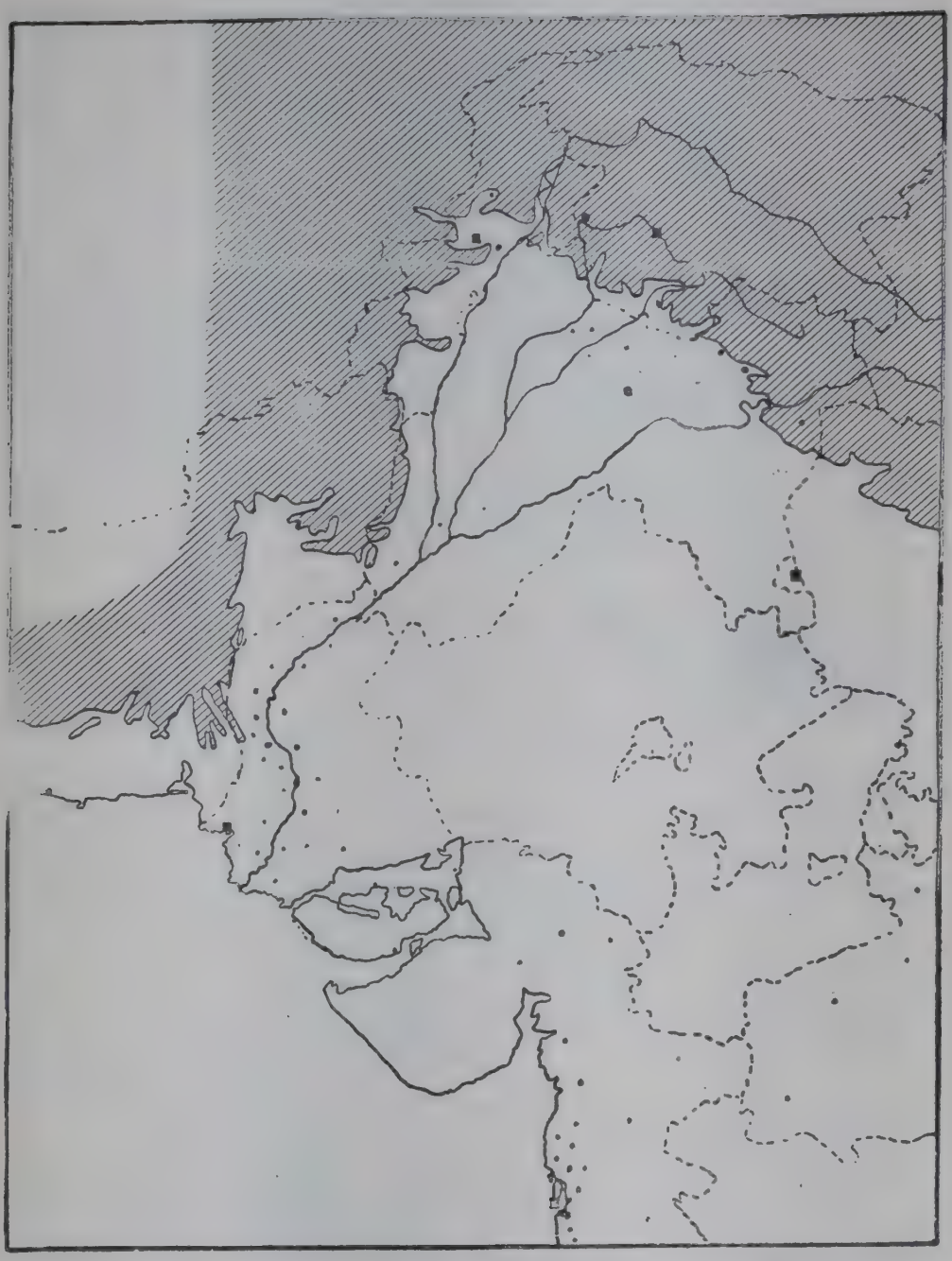


FIG. 32.—The distribution of rice in North-Western India. Land over 3,000 feet shaded. Each dot represents 50,000 acres.

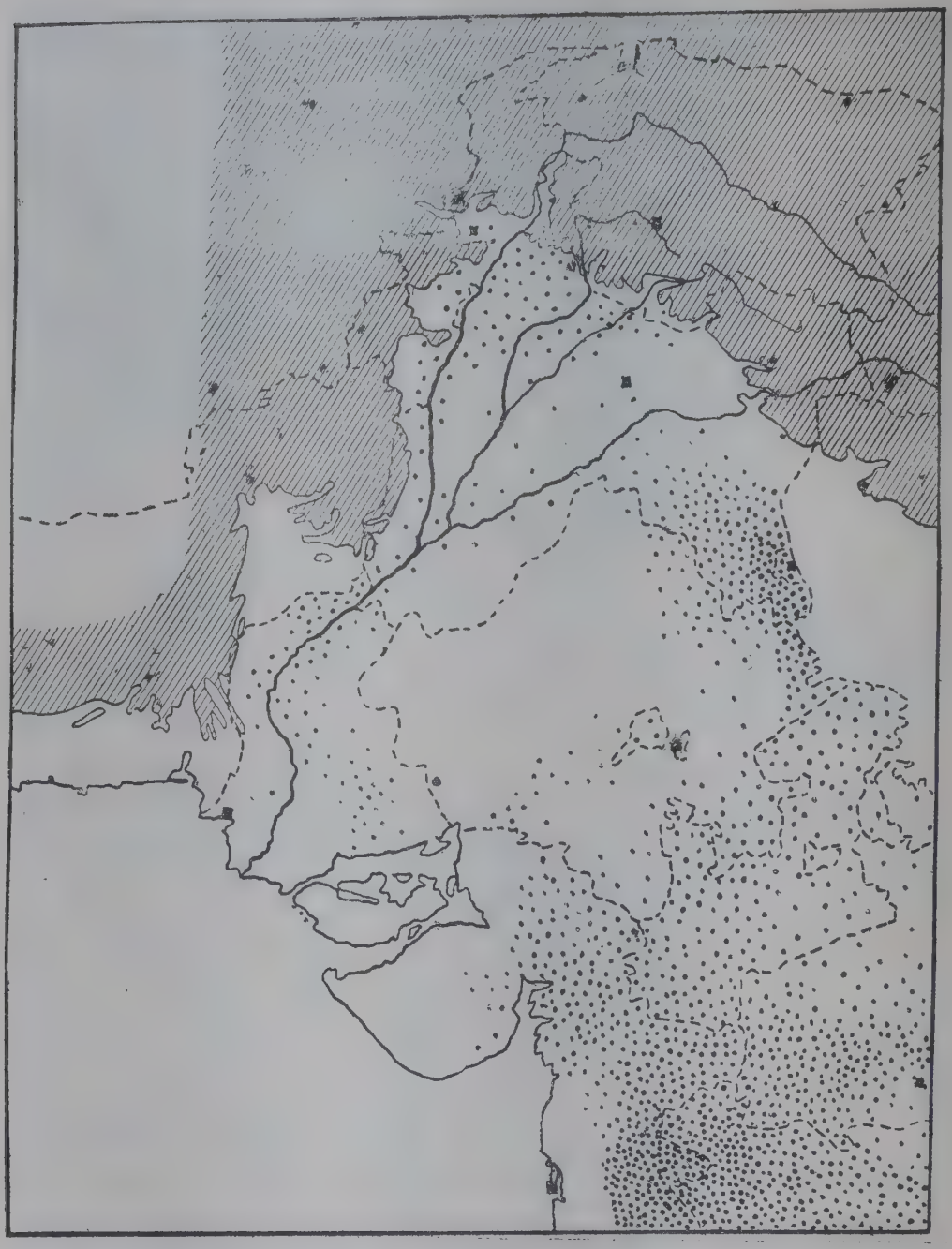


FIG. 33.—The distribution of millet in North-Western India. Land over 3,000 feet shaded. Each dot represents 20,000 acres

commences. Unlike rice, wheat requires only a moderate amount of water and it would be killed if covered by water as rice is. But rice requires a good soil and will not grow in poor dry soils which are good enough for millet. So we find wheat on the fine, rich alluvial soils which are kept sufficiently damp by irrigation. Look at Fig. 34 and notice that the most important areas for wheat are the irrigated Punjab Plains.

(*d*) *Barley.*—Barley is another important crop which grows largely in the same districts as wheat.

(*e*) *Maize.*—Maize is grown both for its grain (Indian Corn) and as fodder for cattle. In the hills, up to 8,000 feet, maize is often the most important crop. It flourishes also on the plains where the rainfall is moderate but is not as a rule the principal crop.

(*f*) *Pulses.*—Pulses of many different kinds are cultivated in most parts of the country. The most important is gram, which affords a good food as well as fodder for cattle.

(*g*) *Sugar-cane.*—Sugar-cane is grown in most of the provinces of India, but not nearly enough sugar is produced and India has to buy a great deal from other countries. A moderate quantity is grown in the Punjab Plains.

(*h*) *Cotton.*—Cotton is obtained from the hairs on the seeds of a plant. When the seed-pods open, the seeds inside are seen to be wrapped in a mass of cotton fibres. The value of the cotton depends on the length of the hairs and there are in India two principal kinds of cotton:—

(i) Native Indian cotton, which has short hairs, or as we say is a 'short-stapled' cotton. It is mainly a Dry Crop and grows where the rainfall is less than 40 inches.

(ii) American cotton, which has longer hairs ('long-stapled' cotton). It is more valuable but requires a better soil and is mainly grown on the irrigated land of the Punjab Plains.

Study Fig. 35, which shows the distribution of cotton.

(*i*) *Oil Seeds.*—Plants grown for the sake of the oil obtained from their seeds include linseed, rape, mustard and sesamum. They grow best with a medium rainfall.

(*j*) *Tobacco.*—Soil is important for tobacco and it grows

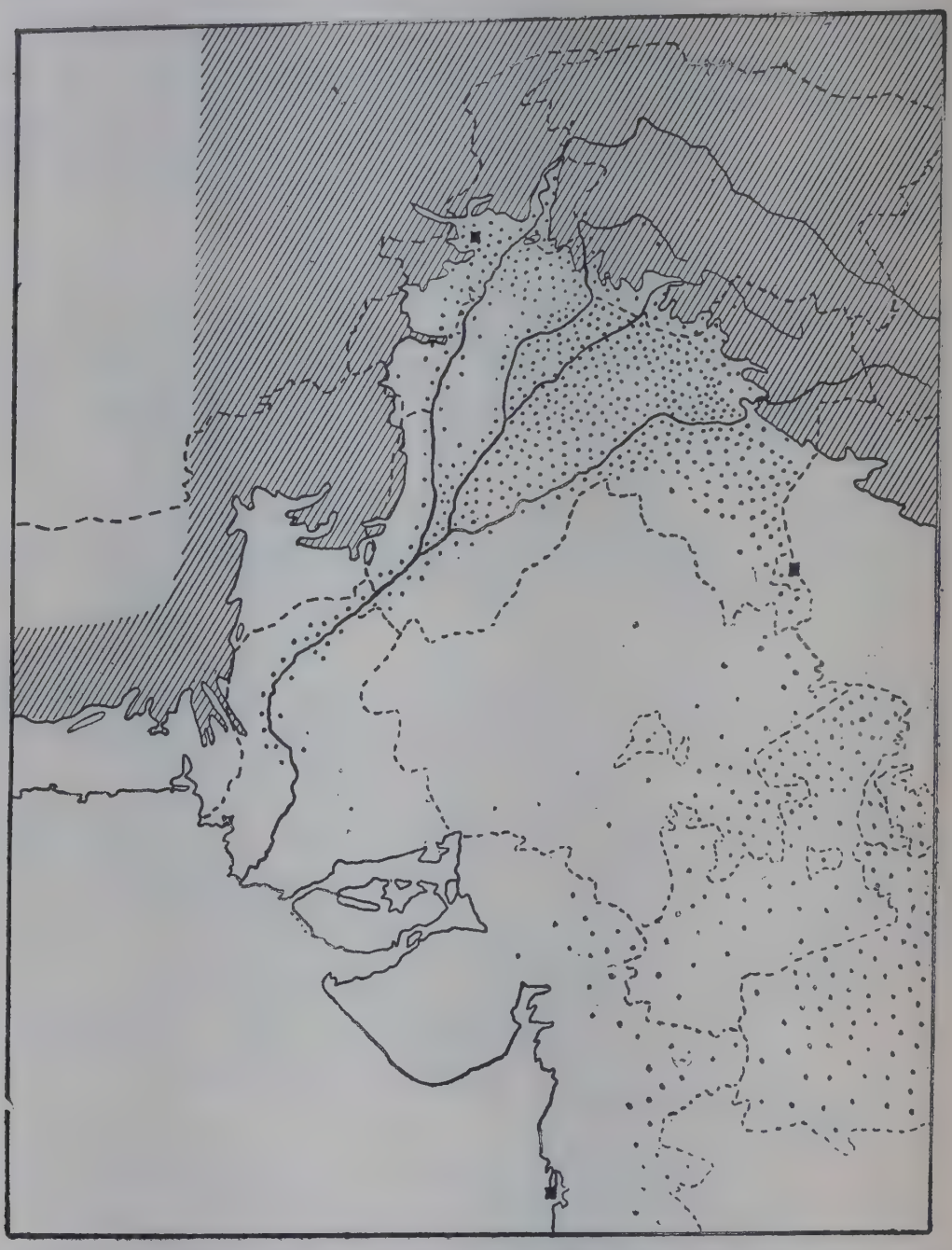


FIG. 34.—The distribution of wheat in North-Western India. Land over 3,000 feet shaded. Each dot represents 20,000 acres.

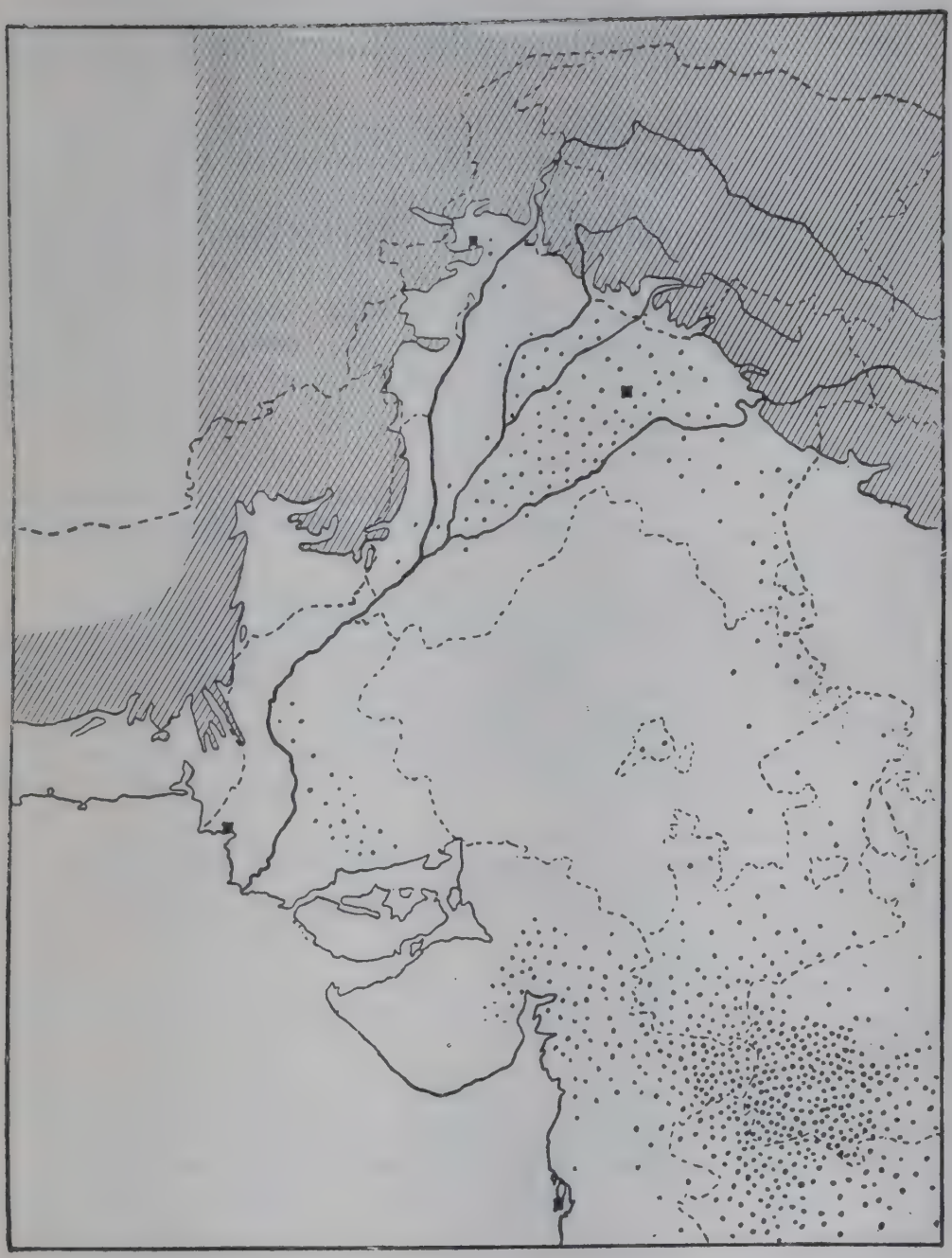


FIG. 35.—The distribution of cotton in North-Western India. Land over 3,000 feet shaded. Each dot represents 20,000 acres.

best on rich alluvial soils on river banks. A little—just enough for local use—is grown in most districts.

Study carefully the little maps showing the distribution of crops. Try to understand in each case *why* the crops grow where they do.

5. Closely connected with agriculture and crops are the animals which man keeps to be of service to him as food (meat of cattle, sheep and goats) to provide drink (milk from cows and goats) to provide clothing (wool from sheep, leather from skins of cattle and goats) or as beasts of burden, to draw carts, ploughs, etc. (cattle, horses and camels). In the 'Useful Tables' at the end of this book you will find a statement of the numbers of these 'domestic animals' found in each province, together with the numbers of ploughs and carts.

Oxen.—There are 25 million oxen in the area we are studying, that is, roughly one bull or bullock or cow for every three people.

Buffaloes.—There are 9 million in North-west India.

Sheep number 10,000,000 and are found in the Punjab, Sind and Rajputana and they can live on waste land where the grass is not good enough for cattle.

Goats number 9,000,000 and are found everywhere; they can live on much poorer land than sheep and can eat almost any green plant.

Horses and *Ponies* number only 800,000 and show you that horses are not used for ploughing as they are in other parts of the world.

Mules and *Donkeys* are most useful in the hills and in dry regions. So we find large numbers in the dry Punjab Plains.

Camels.—The camel is called the ship of the desert, because it can travel across deserts, going for long periods without water, and has broad feet which do not sink in the desert sand. In the wetter parts of India there are no camels but in our part, which is a dry part, there are very many of them.

Ploughs.—There are 4½ million ploughs in the North-West Frontier Province, Punjab, Sind and Rajputana—roughly one plough for every seventeen men, women and children.

Carts are used everywhere except in the hills and the deserts.

QUESTIONS AND EXERCISES

1. Draw a sketch-map of North-western India shading those parts which produce (*a*) wheat (*b*) cotton (*c*) millet.

2. What parts of the following plants are useful to man :— Maize, tobacco, cotton, rape, barley, millet, gram, sugar-cane. What is each used for ?

3. Draw two sketch-maps of North-western India ; one showing the rainfall and one the useful forests. What do you notice ?

4. What different kinds of desert are there ? Describe them.

5. Draw a sketch-map of North-western India to show the artificial vegetation. Mark the principal cultivated areas and the crops grown.

CHAPTER VIII

POPULATION

1. Man's needs consist chiefly of two things, namely, food and clothing. In India, the food which most people eat is rice or wheat or millet with vegetables and, sometimes, meat. The clothes people in India wear are cotton clothes, silk clothes, or woollen clothes. If we ask ourselves, 'Where do these things come from?' we see that the woollen clothes are made from the wool of sheep which live on grass growing on the ground; the silk comes from the silk-worm which lives on the leaves of bushes and trees which grow in the ground; cotton comes from a plant, and the rice, wheat, maize, and vegetables that we eat also grow in the ground. Meat comes from animals and birds which live on things which grow in the ground. In short, man depends for his life on the soil and the vegetation which it produces.

In civilized countries, men use many things which are made by machinery, from metals found in the ground, such as railway engines and carriages, ships, motor-cars. They also use leather, machine-made cloth, etc.—things made in large factories from materials provided by plants and animals. Thus, not only do they depend upon the productions of the soil, but also upon the productions of machinery, which they themselves can make and control.

2. Now, since man gets much of his food and clothing from the earth, he grows all the things he needs, grass, rice, cotton, wheat, and so on, in fields where he can see after them and grow considerable quantities. This is 'agriculture,' and we find that where the soil is good and the climate suitable, there are many crops grown and men live close together. In many cases, more crops are grown and more cattle and sheep are reared than are required for the use of the people who live in that place. When this happens, the extra produce is sent away to other people

who are without these things, because their soil and climate are not suitable, or because there is no room in their country for them to be grown. In return, these people send the cultivators things made by machinery. Thus, the peoples of the world can be divided into two classes, the people who grow things, and the people who make things. In its simplest form, trade consists of the exchange of food for manufactured articles. We have already given the name of 'agriculture' to the growing of things; the name given to the making of things is 'industry.'

It will generally be found that agriculture and industry go on together in all countries, but in every case, either the one or the other is the more important, so that each country can be classed as an 'agricultural' country or as an 'industrial' country.

3. All parts of the world are not crowded with people, or, as geography books say, they are not all thickly populated. In agricultural and in industrial districts, there will be thick populations, but where the soil and climate are not suitable for agriculture, and where there is no coal or iron or other metals for industries, there will be very few people. We may, therefore, draw a map of the World, and mark on it the places where people live close together, that is, the areas of thick population. This has been done in Fig. 37. Then we can draw another map and mark on it the countries where the people are chiefly engaged in agriculture and the countries where the people are engaged in industry. This is done in Fig. 36. Looking at the map, we can see the 'food suppliers' of the world, and the chief 'makers' of the world. When we compare the two maps we see that the thick population is found not only where the climate is good for agriculture, but also where manufactures are carried on. North-western India is one of the 'food suppliers,' and the food it supplies is wheat. It also supplies cotton made into cloths. We can now realize from Fig. 36 that India is not a country all by itself, cut off from the rest of the world by its high mountains and the sea, but that it takes its place in the world, and more particularly in the Empire, as a supplier of food, receiving in return the things it needs made in industrial countries.

4. When we speak of India as an agricultural country, we must remember that the whole of India is not taken up

FIG. 36.—Map of the World, showing agricultural and industrial regions. Industrial regions black, agricultural regions lined.

FIG. 37.—Where people live. Map of the World, showing thickly populated regions. All parts in black have more than 8 persons living on each square mile of ground.

by fields, because the soil and climate are not everywhere suitable. The unsuitable parts of India will have but few people ; therefore, while the districts suitable for agriculture will be thickly populated, there will be very few people in the hilly or forest regions. Thus, if we take Fig. 31 and shade darkly those parts marked 'cultivated land,' and shade lightly all the rest of the country, we shall have a rough map of the population of the country. This will be a very inaccurate map. In order to understand the geography of our country properly, we must have something more definite.

Every ten years, the Government counts all the people living in all parts of the British Empire. This counting is called taking the Census. There was a Census in 1921. The results of the Census are printed in tables, and, in order to learn something of the population of India, we use the Census Tables.

The total area of the country we are studying is about 700,000 square miles and the number of people 70,000,000 so that if the people were spread out equally all over the country there would be 100 persons living on each square mile of ground ; but we know that in some places houses and villages are very close together, while in others we can travel for miles without meeting a single person, and this shows us that the people are not equally spread about over the country. In other words, parts of North-western India are thickly populated, while other parts are thinly peopled ; we can now find out which parts of our country these are.

If we could place a dot on the map for every person, we should be able to see at once where all the people are, but it is not possible to put 70 million dots on a small map, so we will put one dot for every 20,000 persons, placing each dot on or near the place where the 20,000 people it represents actually live. This is done in Fig. 38. It shows clearly which parts of North-western India are thickly populated, and which are thinly populated. Study the map carefully, and you will see that the people have gathered most thickly in the northern part of the Punjab Plains, along the Indus Valley and along the coast around Bombay. The other parts of the country are only thinly peopled. We can learn a great deal by comparing this map with Figs. 4, 7, 11, 29 and 31. Before reading any further, study carefully

each of these maps together with the population map (Fig. 38) and write down all that they teach you about the

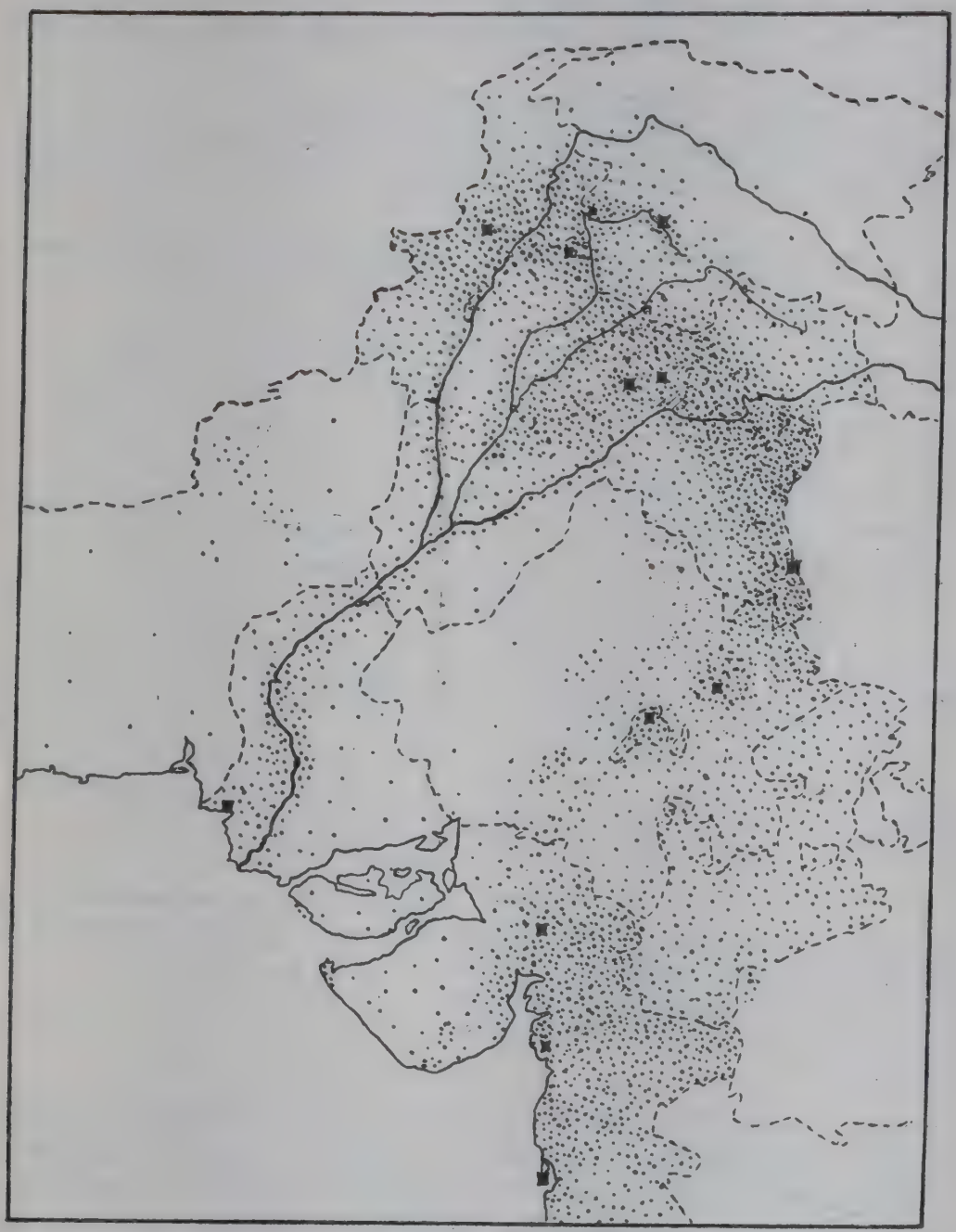


FIG. 38.—The population of North-Western India. Each dot represents 20,000 people. All towns with more than 100,000 inhabitants are marked by a square dot.

reasons for the distribution of population in our part of India.

You will find that most of the people live :

(*a*) on the lowlands ;

(*b*) on the alluvial rocks ;

(*c*) both in the good-rainfall and in the dry-zone districts ;

(*d*) where artificial vegetation is greatest.

The most important thing of all is the fact that population is densest in the agricultural areas. Now look at the little

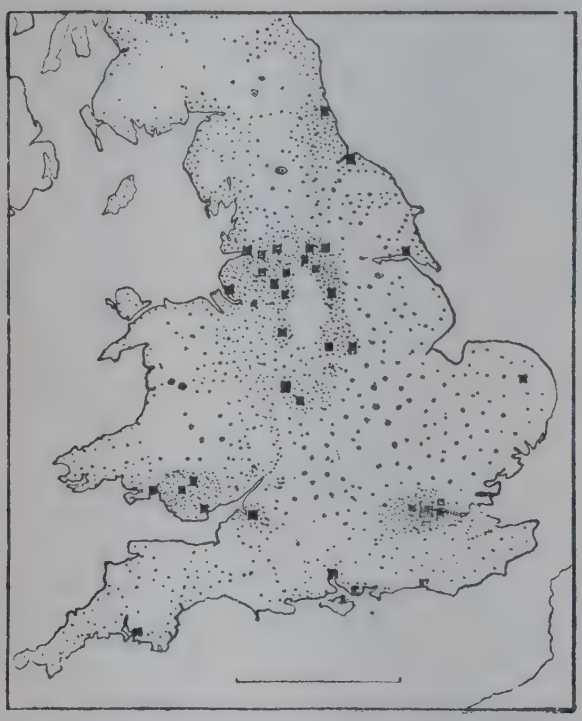


FIG. 39.—The Population of England and Wales. Each square dot represents a town of more than 100,000 inhabitants, each small dot means 20,000 people.

FIG. 40.—Agriculture in England Wales.

maps (Figures 39 and 40) showing the distribution of population in England, and the agricultural areas of England. You will see that whereas in India the people are densest in the agricultural areas, in the case of England the population is thickest outside the districts where agriculture is the chief occupation. These maps prove that India is among the 'Agricultural Countries,' 'the food suppliers,' mentioned on page 67 while England is among the 'Industrial Countries,' the 'makers.'

Agriculture is the determining factor in the distribution of population in India except in a few places where there are manufactures, as at Bombay.

5. Nearly all the races in North-western India have come into the country from the north-west, through the gaps in the mountain wall. Perhaps the earliest invaders came from China or Tibet in some cases. The earliest inhabitants of the country and the first invaders were backward peoples. Later more civilized peoples invaded the country and drove out the others from the fertile plains and made them run away to live in the hills. So we find the most backward people of all still living in the hills —in parts of Peninsular India and in the valleys of the Himalayas. The older inhabitants of India, whose languages we call the Dravidian languages, have been pushed right to the south of India. The invaders who settled in the fertile plains are of very varied race—they are as we say, very mixed, and it is difficult to classify them into groups.

(1) People of the Western Hills—including the manly Baluchis and the brave Pathans.

(2) People of the Himalayas—including the Kashmiris and numerous hill tribes. The hill tribes are mongoloid, that is they have flat faces like the Chinese, usually with very little hair on their faces. Some of them have eyes shaped like a Chinaman's and some have a yellowish brown skin.

(3) People of the Plains—these people can be grouped according to caste, or into divisions according to religion, or again according to languages. Note especially the Jats of the Punjab, and the Rajputs of Rajputana.

6. Let us now look at the different languages spoken in our country. Fig. 41 has been drawn to show you where these languages are spoken.

(*a*) There are the languages spoken by the people of the Western Mountains. We call these Iranian languages because they are like the languages of Iran or Persia. Biluchi (or Balochi), the language of Baluchistan, and Pashtu (or Pashto) the language of the North-West Frontier Province, are the most important.

(*b*) There are the languages spoken by the hill tribes of the Himalayas. We call them Tibeto-Chinese languages and they are quite different from ours.

FIG. 41.—The Languages of North-Western India.
(*Note.*—For Iramin read Iranian.)

(*c*) There are the languages of the plains which we can call 'Indian' languages. The most important are Panjabi, Lahndi or Western Punjabi, Western Hindi, Rajasthani, Sindhi and Gujarati. Indian languages have spread into the mountains of the north, where Kashmiri and Pahari are spoken.

7. We must now learn a little about the different religions of the people of our country.

(*a*) Mohammedans. In the north-west by far the largest number of people are Mohammedans but they become less and less numerous as we go south-eastwards.

(*b*) Hindus, on the other hand, are most numerous in the south-east. On the whole, Hinduism is the most important religion in India.

(*c*) Sikhs. The great home of the Sikh religion is the northern part of the Punjab Plain, where more than one-third of the people are Sikhs.

(*d*) Buddhists. The mongoloid hill tribes, like the Tibetans themselves, are Buddhists.

(*e*) Christians are found scattered throughout the country but are most numerous near the coast.

8. We have now studied North-western India as a whole from the points of view of position in the world, structure, climate and the effect of these on its vegetation and people. In the next and following chapters we shall divide the country into parts and study each part in greater detail.

QUESTIONS AND EXERCISES

1. Find from your atlas and Fig. 37, the names of all the more densely peopled parts of the world.
2. Explain why most of the people of England do not live in the agricultural districts.
3. Make two lists, one of the names of the chief countries which are 'makers' and one of those which are chiefly 'feeders.'
4. Draw a sketch-map of North-western India and show by shading where there are most Mohammedans, Hindus and Sikhs.
5. From the 'Useful Tables' at the end of this book find the number of people who speak your own language. Draw diagrams to show how many people speak the other languages of this part of India.

CHAPTER IX

NATURAL REGIONS

1. We have seen that North-western India may be divided into parts which differ widely from one another in physical features, climate and productions. If we compare a Kashmiri living in the Himalaya Mountains with a cultivator living near Lahore or Bombay, we see that they live in different climates (look at Figs. 14, 15 and 29) that the one when he travels to the next village, has to climb high hills and cross narrow valleys whilst the other probably travels by bullock cart across the flat plain (look at Fig. 7) and that while the man of Kashmir lives partly on maize, the man at Lahore probably grows wheat and eats it as his principal food, while the man near Bombay may live on rice.

If we are to understand the geography of North-western India clearly we must divide the country into divisions, seeing that each division we make has more or less the same sort of surface, a similar climate and similar productions. Such divisions are called the Natural Regions of a country, because they are the divisions into which the country is divided by nature. You will say that North-western India is already divided into Provinces and States—North-West Frontier Province, Kashmir, Punjab, Baluchistan, Sind, Rajputana, etc. But these divisions are no use to us for geographical purposes because they are not based on surface or climate or productions : they are not Natural Regions. Government divides the country into 'Provinces' and 'Divisions' and 'Districts' and 'Tahsils' but they are not natural divisions. In 1905 and again in 1912 Government completely altered several of its Provinces, but we can never really alter the Natural Regions of a country.

You must not think that a Natural Region is one which has not been touched by man. There are natural regions where man has done very little to alter the nature of the country, but there are other natural regions like the Punjab

Plains where man has done a very great deal to alter the country. In many of the maps which follow in this book you will find that the Natural Regions have been marked off by lines. In some cases it is possible to say very closely where one natural region ends and another starts. For example where the Salt Range rises from the Punjab Plains is the division between two regions. But in many other cases it is very difficult to say where one region ends and the other begins. They fade gradually into one another. So, although the map may show a line separating two natural regions, it is often very difficult to say exactly where the dividing line should be drawn. Often too, a natural region varies a little from one part to another, but as far as possible each natural region should have the same physical features throughout (mountains, hills, plateau or plain), the same climate and as a result more or less the same vegetation and crops.

2. Let us see what are the Natural Regions into which North-western India is divided.

Let us take first of all the great mountain wall of the north, formed by the Himalaya Mountains and occupying a great part of Kashmir and the Punjab Province. This region we shall call the Himalayan Region.

We shall learn later that between the fertile plains of the Punjab and the Himalaya Mountains, there is a tract of land quite different from either. It includes the outer hills or 'foothills' of the Himalayas and the lower slopes of the mountains. This we shall call the Sub-Himalayan Region.

We learnt in Chapter V that there is a large part of Kashmir lying to the north of the Himalayan Chain. We learnt in Chapter VIII that it is inhabited by peoples very different from the rest of India. This forms part of the great Tibetan Plateau Region.

Now let us look at the western part of the mountain wall. In Chapter V we learnt that Baluchistan is a dry region outside the influence of the monsoon. So we shall treat Baluchistan as a natural region.

To the north-west of the Punjab Plains rise the ranges of hills known as the Salt Range. Beyond is a low plateau, then the Indus Valley and then hills of the North-West Frontier Province. This a varied region, but it is hilly,

and although it gets the monsoon winds, it is a dry region. So we call it the Dry Hills of the North-West or simply the North-West Hills.

The Punjab Plains form another natural region bounded by the Sub-Himalayan on the north and by the Desert on the south. We shall see later that the Punjab Plains fall into three sub-divisions.

The Lower Indus Valley or Sind is separated from the Punjab Plain by the constriction or narrow portion of the Indus Valley near Sukkur. The Lower Indus Valley forms another natural region.

Now we turn to the south east of our area, where the almost useless Thar Desert forms a natural region. This passes gradually into higher land and damper regions—an upland country with lines of hills and inhabited by the Rajputs or people speaking Rajasthani. We will call this the Rajput Upland Region.

One region only now remains—the comparatively low-land strip along the coast in the Bombay Presidency, including most of Baroda and the Peninsula of Kathiawar. This is a varied region but we will consider it together as the Gujarat Region.

3. These, then, are the Natural Regions of North-western India.

(1) The Himalayan Mountain Region—very mountainous (Fig. 7), wet (Fig. 29) and cold owing to its height (Figs. 14 and 15).

(2) The Sub-Himalayan Region—hilly, moderately damp (Fig. 29) largely uncultivated (Fig. 31).

(3) The Tibetan Plateau—very high (Fig. 8), very dry (Fig. 29), very cold (Figs. 14 and 15), a barren desert (Fig. 31).

(4) The Dry Hills Region of the North-West—hilly (Fig. 7), dry (Fig. 29), but feeling the monsoon (Fig. 25).

(5) Baluchistan—a plateau or mountainous (Fig. 7), very dry (Fig. 29), not feeling the monsoon (Fig. 25), very sparsely peopled (Fig. 38).

(6) The Punjab Plains—flat (Fig. 7), dry (Fig. 29), great variation in temperature (Figs. 14 and 15), thickly populated (Fig. 38).

(7) The Lower Indus Valley—flat (Fig. 7), dry (Fig. 29), smaller range of temperature (Figs. 14 and 15).

(8) The Thar Desert—sloping land, dry (Fig. 29), barren waste (Fig. 31), almost uninhabited (Fig. 38).

FIG. 42.—The Natural Regions of North-Western India.

(9) The Rajput Upland Region—a plateau or hilly (Fig. 7), moderately dry (Fig. 29), moderately populated (Fig. 38), people speaking Rajasthani (Fig. 41) and living mainly on millet (Fig. 33).

(10) The Gujarat Region—mainly lowland (Fig. 7), moderately wet (Fig. 29), small variations in temperature (Figs. 14 and 15).

Fig. 42 is a map of North-western India showing these Natural Regions.

4. When Fig. 38 is compared with Fig. 31 it is clear that the Punjab Plains, Lower Indus Valley, Gujarat and the Rajput Upland are the most important regions. The least important are the deserts (Thar Desert and Tibetan Plateau and Baluchistan) or the great Mountain Region. Although the Punjab Plains or Lower Indus Valley may be as dry as the Thar Desert man has done more there to alter natural conditions by irrigating the land.

When we have clearly grasped these natural regions and the geographical reasons for dividing the country up into these ten parts, we must proceed to study each region and discuss the reasons for the difference between each.

QUESTIONS AND EXERCISES

1. What do you understand by a natural region ?
2. Draw from memory a map of North-western India showing the Natural Regions.
3. Look at the course of the River Indus. Does it flow through one natural region the whole way ? If not, why not ?
4. Which are the rainiest regions of North-western India ? The most thickly populated ?
5. Take each of the natural regions shown in your sketch-map (Question 2) and explain in what ways each one is different from all the rest.
6. Explain why it is necessary to divide a country into Natural Regions for purposes of geographical study.
7. Find from your atlas another region in the world like (1), (3), (4), (5), (6) and (8).

CHAPTER X

THE HIMALAYAN REGION

1. We are now going to learn something about the great wall of mountains which shuts off India on the north. The word 'Himalaya' means the 'abode of snow' and refers to the coat of snow which never leaves the high mountains. Unless you live somewhere near the foot of the mountains, you have probably never seen snow and it must be very difficult to picture what a great mountain covered with snow looks like. But perhaps you have been to the bioscope and seen pictures with snow there.

In order to find out what the Himalaya Mountains look like let us make a journey up to Simla. You know that in April, May and June it gets very, very hot and you find it difficult to work in school. So difficult it is that most of you have holidays from school at that time. You can imagine it must be still harder for Europeans, who are used to a much colder country, to live on the plains during the Hot Season. And so they have built a town high up in the mountains, 7,000 feet above the plains below, where they can go and work during the Hot Weather. You have learnt in Chapter IV why it is much cooler in the hills. This town in the hills, called Simla, is reached by a little mountain railway. If the railway had not been built it would take us many days to climb high hills, covered with forest, cross deep narrow valleys and climb still more hills before we could reach Simla. But now the little railway takes us up the 7,000 feet in a few hours. Away from the railway, cart-tracks are very few and travelling is measured not by miles, but by the number of hours required for the journey. The little mountain railway has rails only two feet apart (we call this a two-feet gauge) and starts from the plains, which although many hundreds of miles from the sea, are there less than 1,000 feet above the level of the sea. From there the railway winds about amongst the forests of the Submontane Region. When it

FIG 43. Section through the Himalaya Mountains of Kashmir.

has climbed 3,000 feet we see signs of change; fir trees appear and then at 5,000 feet we pass out of the tropical scrub and the different kinds of trees remind us that we are now in the Himalayan Region. Still we wind about amongst forest-covered hills, getting steadily higher and higher till at last we reach Simla more than 7,000 feet above the level of the sea. Let us suppose we have been fortunate and arrived on a day when the air is fine and clear. Away to the north we may get a glimpse of giant mountains covered with snow.

2. Let us now take a journey from Simla and learn something about the Himalayan Region. This part of the Himalayas does not catch the full force of the South-West Monsoon but the rainfall is much heavier than on the plains—it is more than 60 inches. If we go further east it gets more and more for the monsoon wind has not to blow so far across the land before it reaches the mountains. If we stand on one of the hills near Simla we can see the clouds rolling up from the sea in the Bay of Bengal. We are so high that we are above the clouds and when they

strike against the mountains we find ourselves enveloped in a thick white mist and everything around us is hidden. That is what it feels like to be in a cloud and for half the year the Simla hills are covered by such mists. As we go on our journey the vegetation around us is everywhere very rich. The forest consists of broad-leaved evergreen trees, of which different kinds of oak are the most important, mixed with beautiful and stately pine trees and deodars. Some of them are so large that two men could scarcely make their hands meet around the trunk, and these trees are straight as a ship's mast. Their leaves are very narrow—shaped like large needles—and the ground beneath the trees is covered with brown 'pine needles' and pine cones, which give a fresh healthy scent to the air around. As we pass along, we notice that wherever the bark of the pine tree has been injured, thick resin oozes out and solidifies on the surface.

As we rise still higher we leave the pines and about 10,000 or 12,000 feet enter into what is called the Alpine zone. Here the ground is covered with *Rhododendron* and other dwarf shrubs sometimes forming dense thickets, at other times forming trees with red twisted stems. The higher we go the poorer and small become the shrubs; much of the ground is covered only with tufts of mountain flowers or grass. Above us we see stretches of snow and if we are able to climb high enough we pass at 16,000 feet above sea-level into the land of everlasting snow. The 'snow-line' is the line above which the heat of the sun in the hot season is unable to melt the snow which falls in the cold season.

We have learnt from our journey that the Himalaya Mountains can be divided into three belts, according to the vegetation and height above sea-level:—

(3) Snow ...	...	16,000 feet to the top of the mountain.
(2) Alpine Belt	...	12,000 feet to 16,000 feet.
(1) Temperate Forest Belt	...	5,000 to 12,000 feet.

Although the forests are dense and contain many different trees yet they are of little commercial value at present. They are too far away. It is difficult for a man to get from the plains to the hills and, therefore, almost impossible

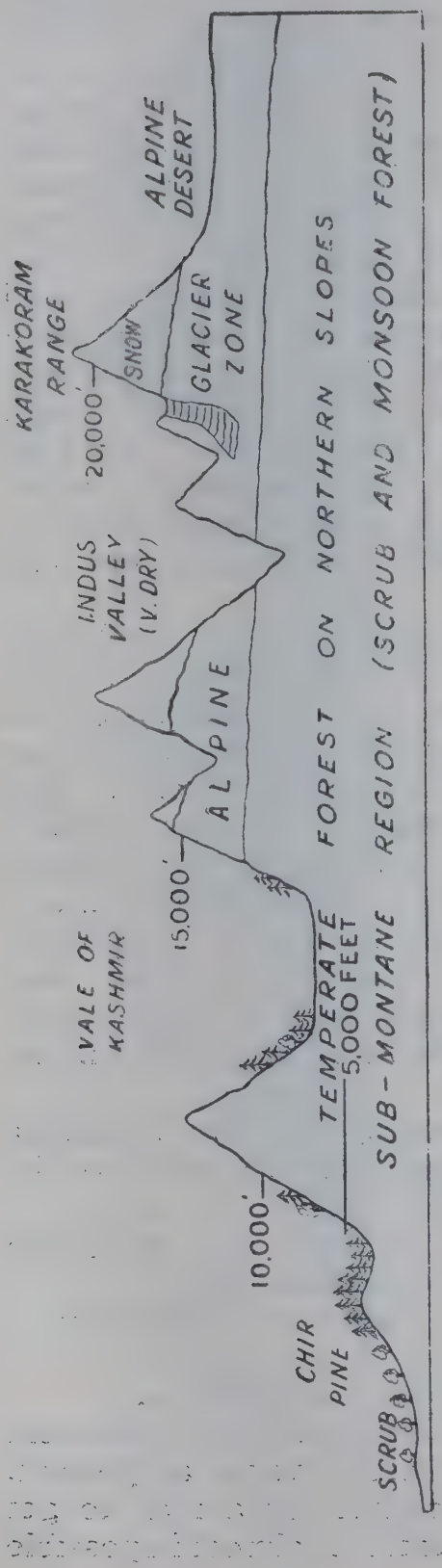


FIG. 44.—Section showing vegetation zones of the Himalayas of Kashmir.

for him to live there, cut down the trees and send the logs to those places where they can be sold. The cost of getting at the timber, or other forest products such as resin, is so great that it does not pay to try, and so the forests are left to themselves, except where they are nearest to the plains. In the colder parts of the world such as Norway, Sweden, Russia and Canada there are great pine forests like those on the Himalaya Mountains but growing near sea level and so easily reached. Most of the boxes in which goods from foreign countries are brought to India are made from the wood of these forests.

A large part of Kashmir belongs to the Himalayan Region and there it is possible to use some of the forests. The most valuable timber is deodar. The blue pine is also valuable. The trees are cut down and the logs of wood are floated down the streams to saw mills on the plain.

3. There are many things which we can learn in the mountains and which we cannot understand easily if we live in the plains. Let us stop for a moment and look at one of the rivers in the Himalayan Region. In the Rainy Season it is a roaring,

rushing torrent at the bottom of a deep V-shaped valley—quite different from our quiet rivers of the plains. Its floor is strewn with big stones and boulders which the stream is pushing gradually downwards, knocking them against one another and breaking off pieces and rounding the bigger ones. Gradually the stones are worn smoother and smaller. The little pieces which are broken off form sand and the smaller pieces are just like mud. When after a long journey this fine material reaches the plains it will form the alluvium which we know so well. Here in the mountains we can see the alluvium in the process of formation. Let us follow up the mountain torrent and find its source. It will take us many days of hard travelling for we shall find the stream has many waterfalls up which we must climb and the forest on either side is dense. After a long time the forest becomes thinner and we emerge into the Alpine zone. We are now very high up and the air feels very cold. We put our hand in the water of the stream and find it as cold as ice. If we go on a little further we may find that our stream is flowing from a hole in a mass of ice. We climb up on to the ice and find that it stretches right away up into the mountains as a river of ice. Such a frozen river is called a glacier. As we stand on it it does not seem to move but if we could watch it from day to day we should find it moving gradually downhill and melting to form the river. On either side of us rise rugged mountains, partly covered with snow, but with steep slopes of bare rock. At the bottom of the steep slopes are piles of broken rocks, rough pieces of all shapes and sizes. Piles of rock at the bottom of steep slopes like this are called 'screes'. How do they get there? Well, water gets into the cracks of the rocks of the mountains and during the cold night freezes. Water when it freezes expands or grows larger and so the crack in the rock is made bigger. When the water melts or thaws again a big piece of rock will fall off and down into the valley. So we see the high mountains are gradually cut away by the action of 'frost' freezing the water in the cracks. Some of the pieces may fall on to the glacier and be gradually carried down into the river valleys. Read again what you have read about 'Rain and Rivers' in Chapter II.

4. In the east the great Himalayan Range is comparatively narrow. To the north lies the great plateau of Tibet and to the south lies the great plains of the River Ganges. But towards the western end, which we are studying in this book, the mountains broaden out and occupy a great part of Kashmir. We can distinguish four great parallel ranges of mountains. Between the four ranges are great

FIG. 45.—The Tibetan Plateau and the Himalayan Region.

river valleys. Look carefully at the map, Fig. 45, where these ranges are marked. Here are the four ranges:—

Muztagh-Karakoram Range.
The Inner Himalayas or Zanskar Range.
The Middle Himalayas or Pangi Range.
The Outer Himalayas or Pir Panjal Range.

The Muztagh-Karakoram Range is the highest of all, and there are many great peaks more than 25,000 feet, of which K2 or Mount Godwin Austen is the highest, and probably the second highest mountain in the world. This great chain of mountains completely shuts off the bleak Tibetan Plateau beyond. One difficult gateway or pass—the Karakoram Pass—crosses the range and is the road from Leh to Tibet.

The Inner Himalayas also form a great wall, with many peaks more than 20,000 feet high.

The Middle Himalayas are not quite so high, but many peaks are more than 15,000 feet high.

The Outer Himalayas have an average height of 14,000 or 15,000 feet. Though the peaks are not much more than half the height of Mount K? it is this range, with its snowy crest, which the dwellers in the plains can see.

5. Now let us look at the rivers of this region. The Indus River rises in the Tibetan Plateau and for a long distance flows between the great Karakoram Range and the Inner Himalayas. You learnt in Chapter V that the Monsoon is not felt on the Tibetan Plateau; in reality it is the Inner Himalayas which prevent it being felt and so the Upper Indus Valley, around the town of Leh, is very dry.

After the town of Skardu, the Indus passes through a tremendous gorge and then turns southward, then west again and finally south till it cuts its way through the mountains to the plains.

Between the Middle and Outer Himalayas is a valley different from most of the mountain valleys. It is broader and has a lake (Wulur Lake). This valley is the Vale of Kashmir and is one of the most beautiful valleys in the world. The river draining it is the Jhelum, on which is situated Srinagar, the principal town of Kashmir.

The rivers of the Punjab Plains—the Chenab, Ravi, Bias and Sutlej have cut through the Outer Himalayas and sometimes the Middle, but only the Sutlej cuts right through and rises in Tibet.

Note carefuliy on the map the few and difficult passes through the mountains—one from Srinagar across the Zojila Pass to Leh and then to Yarkand in Tibet.

6. We have spoken above of the forests of the Himalayas. One point we should notice. The forests are

usually on the northern sides of the mountains, where they have more shade so that the snow remains longer and the moisture is not dried up by the sun. The southern side of the hill is often a bare stony slope, or covered with short grass and bushes. There are few people in the mountain regions and often they have to grow their crops in tiny fields on the hillsides. Below 8,000 feet the most important crop is maize, but wheat can also be grown to this level. Buckwheat is grown on the poorest, stony soil, whilst rice is grown in tiny fields at the bottom of valleys. The little rice fields are carefully levelled and water brought to them in little canals. The Kashmiris live in the more sheltered valleys but in the wilder parts like the Indus Valley the only inhabitants are wandering shepherds.

FIG. 46. Proportion of cultivated land (black) in the Himalayan Region of Kashmir.

Fig. 46 shows you very roughly the small amount of cultivated land.

Natural Regions do not take any notice of political boundaries and we find that the natural region we are now studying occupies a great part of Kashmir including Jammu and extends across the boundary to take in the States of Chamba, the district of Kangra and the Simla Hill States included in the Province of the Punjab.

Of the towns in this region there is Srinagar in the Vale of Kashmir, Leh and Skardu in the Indus Valley and the hill station of Simla on the Outer Himalayas.

The beautiful Vale of Kashmir deserves a special description. The hillsides, for example at Gulmarg, owe their beauty largely to the rich growth of mountain flowers. The more accessible hill slopes are covered with terraced fields and the Vale is famous for its fine fruits—apples and pears—and nuts such as walnuts. Through the

broad vale wanders the Jhelum River, here navigable and unlike most Himalayan rivers. So valuable for crops is land near the river that the people try to make more by building rafts and sprinkling a little earth on them and then planting seeds on the 'floating island.' Sometimes one man can steal and take away another man's land. Srinagar, is famous for its wood carving industry, local wood being used. Another industry is the manufacture of shawls from local goats wool. The State of Kashmir derives a considerable revenue from the sale of 'kut', a tall herb which is used in medicine.

QUESTIONS AND EXERCISES

1. Describe the natural vegetation of the Himalayan Region.
2. Describe the climate of Simla.
3. Draw a sketch-map showing the main mountain ranges and river valleys of this region.
4. How are rocks worn away in mountain regions?
5. Find another natural region in the world like this one.
6. Write an account of the people of the Himalayan Region.

CHAPTER XI

THE SUB-MONTANE OR SUB-HIMALAYAN REGION

Between the broad cultivated plains of the Ganges Valley or the Punjab and the Mountain Region of the Himalayas there is a belt of country which is very different from either. In some places it is flat or gently waving land only slightly above the level of the plains, but at other places it includes separate ranges of hills—the foothills of the Himalayas.

The Sub-Montane belt is bounded on the south by the cultivated plains of the Ganges Valley or the Punjab; on the north it extends to a height of 5,000 feet in the Himalayas where it passes into the Himalayan Region. In the chapter on the Himalayan Region you learn that the swift mountain streams there are busily breaking up the rocks into small pieces—pebbles and sand. Often the descent to the low ground is sharp and there the streams spread out and deposit a 'fan' of gravel and sand. Much of the Sub-Montane Region consists of sand deposited in this way. Very often we can divide the Sub-Montane Region into two distinct strips. The part nearest the flat plains of the Punjab is only slightly raised above their level. This strip together with the low foothills and slopes of the mountains up to 3,000 feet, is usually covered with poor monsoon forest or with scrub. The most interesting tree in the forest is *Butea*, known by various names such as chichra, dhak, and palah. Probably much of the Sub-Mountain Region was once dhak forest. It makes good firewood, gives a useful gum and dye can be made from the beautiful red flowers and cattle eat the dried leaves. But the dry hill forests of the sub-montane tract are most valued for their yield of Bamboo.

The other strip extends from 3,000 to 5,000 feet above sea-level and the Chir pine is very common. Turpentine can be obtained from the resin of this tree, and there is a Government turpentine factory at Jallo, near Lahore.

The Sub-Montane Region is usually an unhealthy region, but not so bad as it is in the wetter parts in North-eastern India. It is interesting to note that man has built his hill stations, like Simla, on the healthy mountains of the Himalayas just behind.

The Sub-Montane Region has a rainfall of 30 to 40 inches (see Fig. 29) and so dry crops can be grown without irrigation. Wheat and maize are the most important, but gram and millet are also grown, and in addition much fodder. The useless scrub forests are gradually being cut down and cultivation extended.

In a later chapter you will learn of the great irrigation works in the Punjab Plains. The water of the great rivers is ' tapped ' just where the rivers leave the hills and begin to flow across the plains. Along the borders of the Sub-Himalayan Region and the Plains is a line of great irrigation works. There are also numerous trading centres, where people come down from the hills and buy or exchange goods with the dwellers on the plains.

QUESTIONS AND EXERCISES

1. Compare and contrast this region with the regions on either side (study Chapter XV before doing this).
2. Give an account of the useful products of the Sub-Himalayan Region.

CHAPTER XII

THE TIBETAN PLATEAU

1. If we could continue our journey across the Himalayan Region in Kashmir and climb over the high pass of Karakoram (18,000 feet) across the Karakoram Mountains we should find a very great change of scenery. We leave behind us the mountain forests, and little cultivated patches. Instead we find a barren, bleak upland with scarcely any vegetation; a dry sandy waste with salt lakes scattered over its surface. Here and there are ridges of bare stone, crumbling under the destructive action of forest. The total rainfall, including snow, of this barren land is only about three inches a year, but enough to keep much of it covered with snow for many months of the year.

2. Only a small part of this great region lies within the borders of India—in the north-east of Kashmir. This part is almost uninhabited, there are a few wandering traders who pass from Yarkand in Tibet to Leh and Srinagar in Kashmir in the warmer months. This area is part of the highest plateau in the world 'The Roof of the World'. Cold and barren as this land is in the winter, it is almost worse in the summer, for the air is so thin that the sun shines down and makes the rocks too hot to touch, whereas it may be freezing in the shade. The days are hot, but at night it gets very very cold.

Not only is the region outside the Monsoon area of India, but even the rivers flow away from India towards the heart of Asia. It is a region of 'inland drainage'.

The few people who can exist in this region are Mongols more like Chinamen to look at than Indians and by religion they are Buddhists. They obtain salt and another mineral, borax, from the shores of the salt lakes and in the early summer often bring the salt and borax to exchange for Indian goods in the Punjab bazaars. Often they use sheep as beasts of burden and tie the little bags of salt on the backs of the sheep. One important beast of burden in this region is the Yak, an animal rather like a bullock with a large hump and long hair.

In the chapter on the Himalayan Region the Indus Valley in Ladakh, around Leh, was included. Remember that it is a very dry valley and half-way in character between the forested Himalayas and the barren Plateau of Tibet.

CHAPTER XIII

THE DRY HILLS OF THE NORTH-WEST [1]

1. In the north of India there is a dry hilly region divided into two parts by the River Indus. To the east of the river lies the Salt Range and the dry, sandy plateau of Attock: to the west of the river are the hills and mountains of the North-West Frontier Province interrupted by broad fertile valleys such as that of Peshawar.

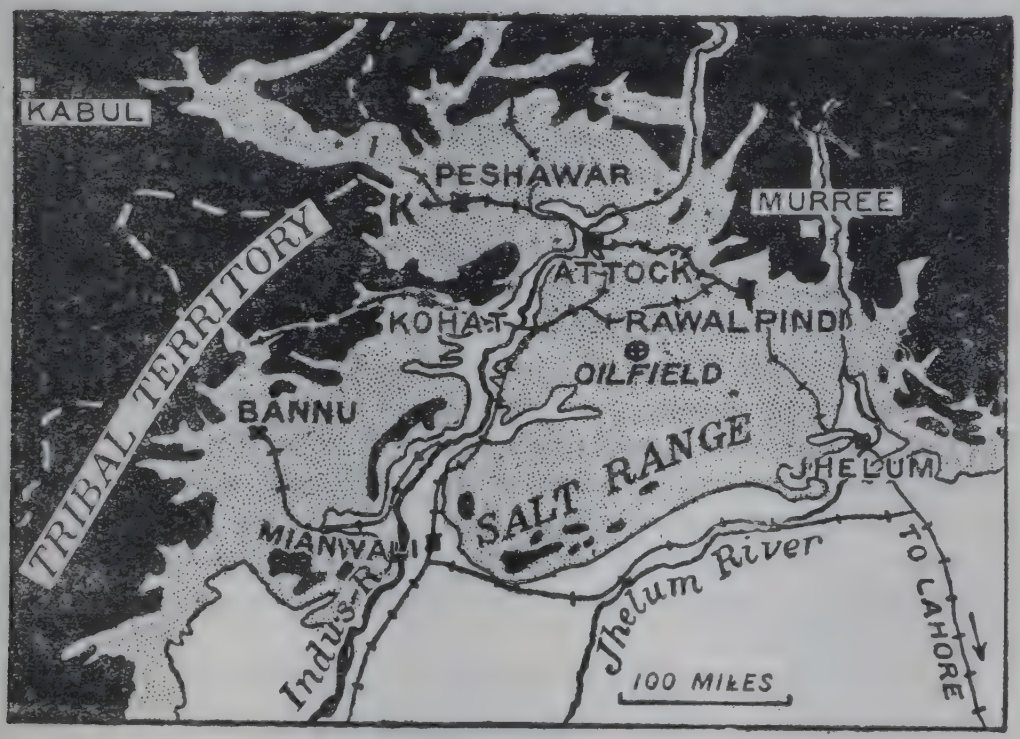


FIG. 47.—The Dry Hills Region of the north-west. Land over 1,000 feet, dotted; over 3,000 feet, black.

The Cis-Indus tract, or part of the region on the east side of the River Indus, consists of a dry, sandy plateau bounded on the south by the Salt Range. Very little irrigation can be practised and the crops depend mainly on the scanty rainfall. In the north, in the Rawalpindi District, the soil is

[1] The whole of the North-West Frontier Province except the northern part; the districts of Jhelum, Rawalpindi and Attock of the Punjab.

richer and well irrigation is practised. The region has mineral wealth—oil in Attock and salt in the Salt Range. The lower slopes of the outer Himalayas bound this area on the north.

The Indus Valley is a fine tract but the harvests vary greatly with the extent of the floods from the river.

The tract between the Indus and the hills of the frontier consists of a series of three plains—Peshawar, Bannu and Dera Ismail Khan—divided from one another by the low hills of Kohat and offshoots of the frontier range. The Vale of Peshawar is highly irrigated and well wooded, presenting in spring and autumn a picture of waving cornland and smiling orchards framed by rugged hills. Adjoining Peshawar is the district of Kohat, a rough hilly tract intersected by narrow valleys. The southern spurs of the Kohat Hills fade away into the Bannu plain. Where it is irrigated from the Kurram River the Bannu plain is very fertile, especially round Bannu itself. Where not irrigated there are broad stretches of rough stony ground broken up by deep gullies cut by flood water from the hills. Nearer the Indus River the plain is more fertile again but its crops depend on the rainfall which varies very much from year to year. A broken range of sandstone hills divides the Bannu plain from the Daman or plain land of Dera Ismail Khan. This plain is a clay desert but the soil is fertile and in good rainfall years there is an abundant crop of grass. In these plains of Peshawar, Bannu and Dera Ismail Khan the summers are very hot and the winters very cold—frost occurs nearly every year. The plain land where fertile is densely populated.

To the west of these three plains lie the barren, treeless hills inhabited by the wild tribes of the frontier—Waziris, Afridis and Orakzais. Here and there are fertile valleys, such as the upper part of the Kurram Valley. In such valleys are little hamlets and sometimes forests of stately pine trees. Some of the hill sides in the valleys are clothed with grass and the people of Kohat keep large numbers of sheep. These inhospitable hills of the frontier are almost outside the influence of the monsoons and most of the scanty rain falls in the cold season. In the cold season it is temperate. All the hill tribes belong to the group of people known as the Pathans. Their own hills

are so barren, that it is difficult to prevent the Pathans from looting the people of the plains.

2. Turning now to the agriculture of the region, notice first Fig. 48. This diagram does not include the hills and

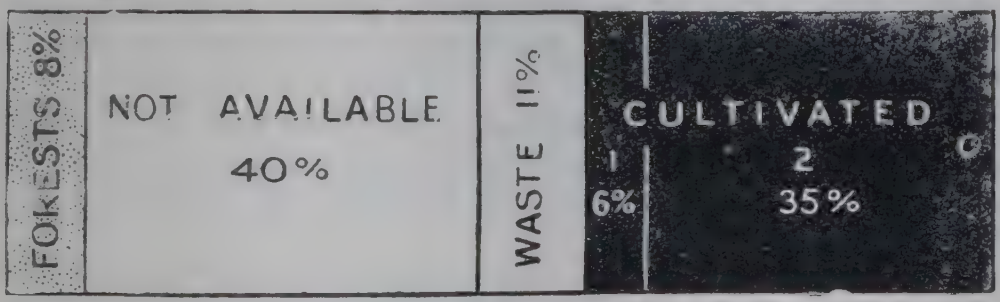


FIG. 48.—Proportion of cultivated land in the N.-W. Hills.

mountains of the tribal tracts, but simply the Districts of Jhelum, Rawalpindi, Attock, Peshawar, Kohat and Bannu. Forests cover 8 per cent, but many of these forests are merely scrubland, valuable because even the poorest timber has a value in such dry country. Nearly half is occupied by hills, mountains, and useless ground and the proportion of waste land which might be used is only small. Most of the waste land is found in the plain of Dera Ismail Khan which is not yet irrigated. The cultivated land comprises both irrigated land and land with dry crops. The most important irrigated areas are in the Vale of Peshawar, watered by the Government Canals known as the Upper Swat Canal, Lower Swat Canal and Kabul River Canal. Many of the crops of the Bannu and Dera Ismail Khan plains are also irrigated, but on the sandy plateau of Jhelum and

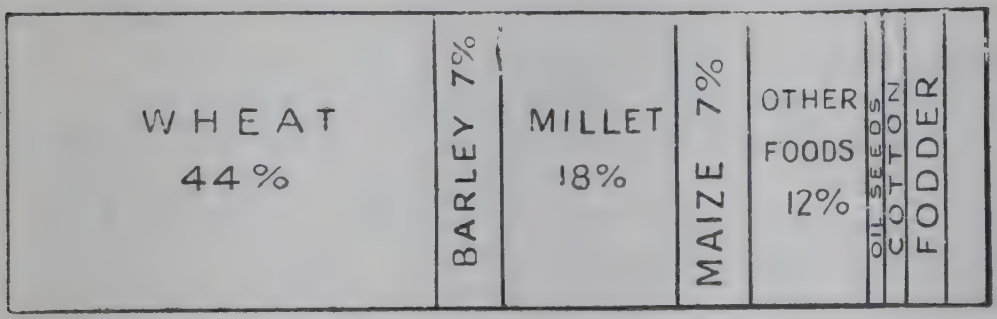


FIG. 49.—Crops of the N.-W. Hills.

Attock dry crops are mainly grown. Fig. 49 shows the crops of the natural region. Wheat is the most important.

Seen in the spring after a few showers of rain, the irrigated plains of Bannu or Peshawar present to the eye a vast waving sea of wheat, with here and there streaks or patches of darker coloured gram. After the harvest the same areas have been described as 'a bleak howling wilderness, fit home for the whistling heat-laden dust storm which often sweeps across its surface.' Millet, the second most important crop, is mainly a dry crop and is the staple product of the Cis-Indus tract. As in other parts of North-western India, there are two harvests in the region, the Rabi and Kharif.

3. One of the great railway highways of India—from Calcutta to Delhi and Peshawar runs right across the northern part of this area. Crossing the Jhelum River at Jhelum it runs across the plateau to Rawalpindi, crosses the Indus where that river runs through a narrow gorge near Attock and up the vale of Peshawar to Peshawar. Above Peshawar lies the famous Khyber Pass, the gate to Afghanistan. A narrow gorge surrounded by high hills from which the wild Afghan tribesmen were wont to fire upon the helpless traveller, the Khyber Pass has had a great importance in Indian history. Some years ago a military road was constructed through the pass, protected by troops. In 1925 all is changed and a wonderful mountain railway threads its way through the narrow pass. Notice also the railway running along the east bank of the Indus, from which there are branches into the hills of Kohat and the Kurram Valley and into the Bannu plain. The map, Fig. 47, shows these railways and also how the railway through Kohat runs right to the frontier, and towards the east connects directly with Peshawar. Railways such as this running to the frontier are called 'strategic' railways. They are built mainly for military reasons. In case of trouble on the frontier soldiers and supplies can quickly be sent from the plains to the frontier stations. In times past the wild tribes of the hills used to descend to the plains and there rob and kill the peaceful people in their villages. Now the frontier is carefully guarded and the people are protected from danger.

Peshawar is the most important town of the North-West Frontier Province. It is the centre of a rich, irrigated plain and the head-quarters of local Government. It controls the

Khyber Pass, and nearly all the trade through the pass to Afghanistan comes through Peshawar. Peshawar is at one end of the route ; at the other end is Kabul, the capital of Afghanistan.

Kohat, *Bannu* and *Dera Ismail Khan* are the natural centres of their respective plains and are all military as well as trade centres.

Rawalpindi is the most important town of the Cis-Indus tract and is almost the same size as Peshawar. It is a military centre, and the railway works of the North-Western

Fig. 50.—The Position of Peshawar.
P = Peshawar ; K = Kohat.

Railway are found here. The main road to Kashmir starts from Rawalpindi and passes through the hill station of Murree. A large proportion of the trade to Kashmir passes through Rawalpindi.

Jhelum on the borders of the North-western hills and the Punjab plain is a depot for the Kashmir timber trade.

The two important minerals in this natural region are rock-salt, which is mined on the Salt Range; and oil which is obtained from the plateau north of the Salt Range.

QUESTIONS AND EXERCISES

1. Compare and contrast this region with the Punjab Plains (Chapter XV).
2. How are the railways of the North-Western Hills limited by physical features ?
3. Give an account of the Vale of Peshawar.
4. Write an account of the climate of the North-West Frontier Province.

CHAPTER XIV

BALUCHISTAN

1. In Chapter XII you learnt a little about the highest tableland in the world—the great Plateau of Tibet. You learnt that the Plateau of Tibet is a dry, barren region cut off from India by the great mountain rampart of the Himalayas. The natural region which we are going to study in this chapter is like the Tibetan Plateau in many ways. It is also a dry, barren region and is cut off from the rest of India by a range of mountains—the Sulaiman Range. But the Plateau of Baluchistan is not nearly so high as the Plateau of Tibet; its average height is only from 1,000 to 3,000 feet above sea-level instead of over 12,000. So it is not nearly so cold.

There is another way in which Baluchistan resembles Tibet. Look again at Fig. 25. The Monsoon, which is so important to us living in other parts of India, is not felt in Baluchistan. The wind cannot cross the Sulaiman Mountains.

Baluchistan is not a flat-topped tableland, but a tableland with a very rugged surface. It is best described as a wild, mountainous country with many deserts. The rainfall is very small and does not, on an average, exceed 8 inches in the year. There are no large rivers which can be used for irrigation as there are in the Punjab but only short rushing torrents which flow after rain but are often dry for many months of the year. The rain falls mainly during storms in the cold season. Just like the dry regions of the Punjab, Baluchistan is very hot in the Hot Season and very cold in the Cold Season (see Figs. 14 and 15). So cold is it in the Cold Season that snow falls instead of rain in the higher parts.

One more curious thing about Baluchistan we must notice. Except near the coast, the rivers do not flow to the sea like nearly all the rivers of India, but they flow into shallow lakes in the midst of the Plateau. The lakes themselves often dry up entirely in the Hot Weather.

2. With the lack of water and the great extremes of heat and cold and the difficulty of growing sufficient crops for food you will see that Baluchistan is not a pleasant country in which to live. Although Baluchistan is nearly

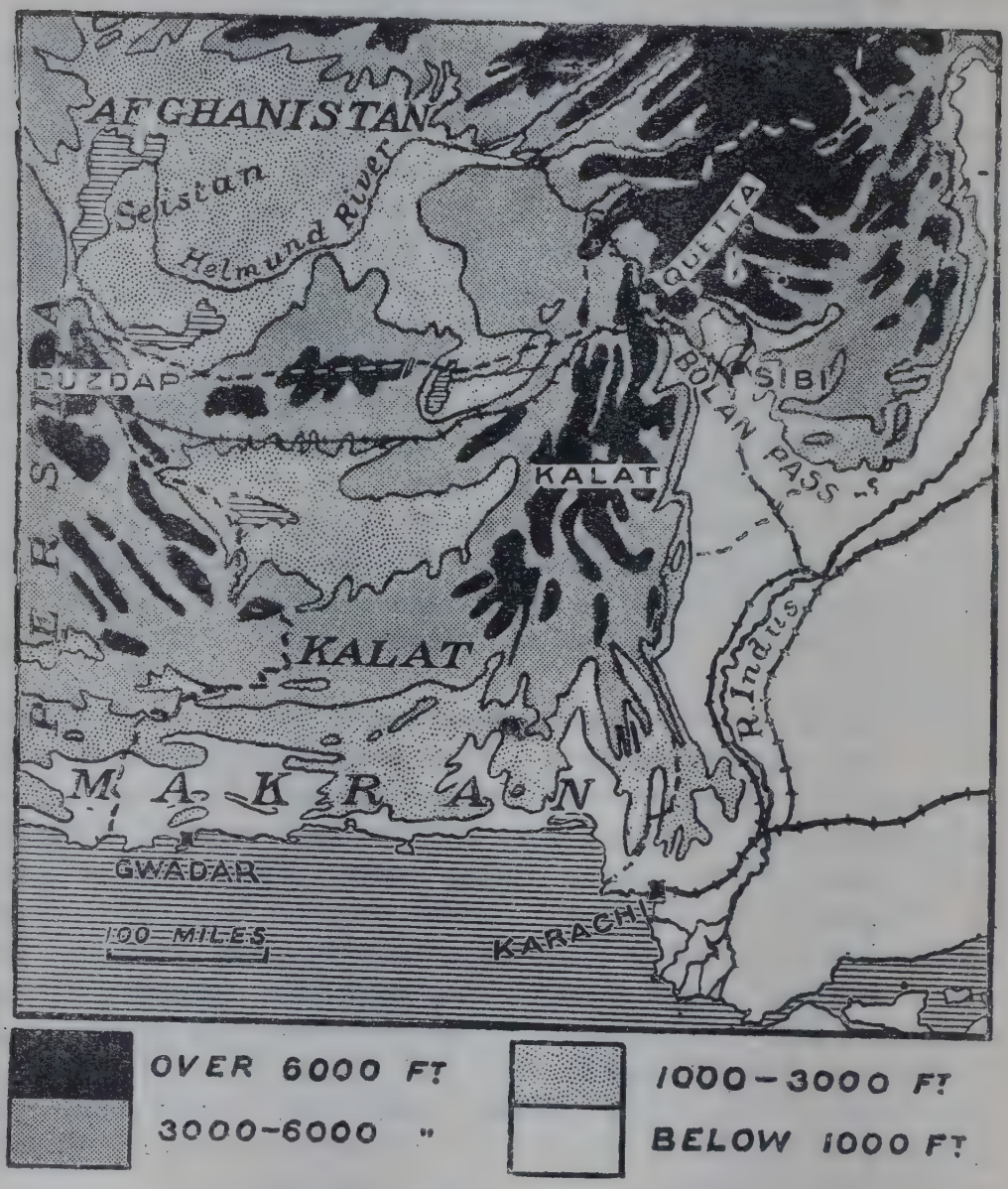


FIG. 51.—Map of Baluchistan.

as large as the whole of the Punjab, there are fewer people living there than in the city of Bombay. The whole population is only 800,000. If we could spread these

people out equally all over the country there would only be 6 people to every square mile—far less than in any other part of India. In the Punjab there are nearly 200 people to every square mile and in the Ganges Delta there are 600. The people are nearly all *nomads*, that is, people who have no fixed home but are always on the move. There are three principal races—the Brahuis, Balochi (or Biluchi) and Pathans—speaking different languages. The Brahuis hate the scorching heat and in the hot weather go into the mountains, driving before them their thousands of sheep and goats, their horses, cattle and camels. In the cold weather they come back to the flat alluvial plains to find pasture for their flocks and herds there. In bad seasons, and often for every winter, many Brahui families march to Sind, returning in the spring. In Baluchistan there are two main reasons why the people are nomads or wanderers. One is the great extremes of heat and cold. The other is the lack of land which can be cultivated or irrigated to furnish food for man and beast, and so the people have to wander from place to place finding pasture. In summer they live in 'jhuggi' or shelters made of branches, or in 'kizhdi', tents made of goat's hair matting or of blankets. In winter they may live in the mud huts of the villages. These huts have walls of straw and mud, with rafters of wood (if possible) and covered with matting of dried palm leaves or tamarisk. It is only in the towns that we find buildings made of mud bricks dried in the sun.

3. We have said that there are no large rivers which can be used for irrigation. But the soil in the valleys is often very fertile and so the people try very hard to bring water to it. The water from the snowfall on the mountains sinks into the ground at the foot of the hills and the people dig long tunnels called 'karez' to get this underground water. Karez are common in Persia, but we do not find them in other parts of India. Land irrigated in this way is only found in a few parts of Baluchistan, but especially near Quetta, in the district of Quetta-Pishin. Here the people are Pathans. A few of the level tracts of alluvium in Baluchistan are irrigated by flood water from the streams. In good seasons, as many as three crops may be grown on the same piece of land. This is done by the

Jatts, who live in the district of Kachhi. The most important crop is jowar (millet). Another crop is wheat, and fodder is grown for the cattle and sheep.

Along the sea coast, in Makran, there are a few fishermen but further inland dates provide food for man and beast for most of the year.

Although there are so few people in Baluchistan they do not all speak the same language. The most important languages are Balochi, Pashto and Dehwari; all of them are Iranian languages and quite different from our Indian languages. Another language, Jatki, is growing in importance.

The people of Baluchistan are mainly Mohammedans. There are more men than women and so it sometimes happens that a woman has more than one husband. The population is not increasing and large numbers of the children die.

There are really no towns in Baluchistan. Quetta and Sibi are both of British origin. Notice very carefully the position of Quetta at the head of the Bolan Pass. The Bolan Pass is by far the easiest route between Baluchistan and India. There is another route along the coast.

Across the deserts of Baluchistan there are numbers of old camel caravan routes. One of the most important of these routes, running along the north of the country and far into Persia has now been replaced by a railway, finished in 1919. Note its position on the map.

QUESTIONS AND EXERCISES

1. Compare and contrast the Baluchistan Plateau with the Punjab Plains (Chapter XV).
2. Describe the irrigation practised in Baluchistan.
3. Write an account of a year in the life of a Brahui man, living in Baluchistan.
4. Draw a sketch-map showing the importance of the position of Quetta.
5. Do you think the Baluchistan Plateau will ever become very important? Give your reasons fully.
6. What is meant by inland drainage? How do you explain it?

CHAPTER XV

THE PUNJAB PLAINS

1. The natural region of Northern India we are now going to study is part of the vast plain of Hindustan. For a thousand miles from end to end there is not a hill in this plain neither is there for hundreds of miles from north to south. Many of you who live in this great region have perhaps never seen a hill ; other boys and girls who live where hills are everywhere cannot imagine what it is like to live in a flat plain and never to see a hill. This great plain is like the sea ; to travel over it reminds you of being at sea. On all sides it stretches away absolutely flat and fades away in the distance. Perhaps in the early morning or in the evening the great heights of the Himalayas away to the north can be seen. Through the plain flow thousands of rivers, large and small, which rise in the great mountains to the north and are fed by the melting snows. All of them sooner or later join the broad stream of the River Indus. The Indus is not only one of the greatest rivers of India, but one of the great rivers of the world. It is not so long as many others in the world, it is not even so long as the Brahmaputra but its valley and those of its tributaries which wander across the Punjab Plains are amongst the most important in India. Dotted over the great plain are villages of the cultivators, and here and there are large and busy towns. Everywhere else stretch fields of golden wheat or barley, or green fields of paddy and other crops.

2. The word ' Punjab ' or ' Panjab ' is a Persian word meaning ' five waters ' or ' five rivers '. The Punjab plains are really the valley plains of the five rivers—Jhelum, Chenab, Ravi, Bias and Sutlej. These five rivers flow from the great mountain wall, in a south-westerly direction and all five join to form one river which then joins the River Indus in the south-west corner of the Punjab. Look at

Fig. 52 and notice carefully the course of the Punjab rivers. In the dry season the rivers of the Punjab are shallow and

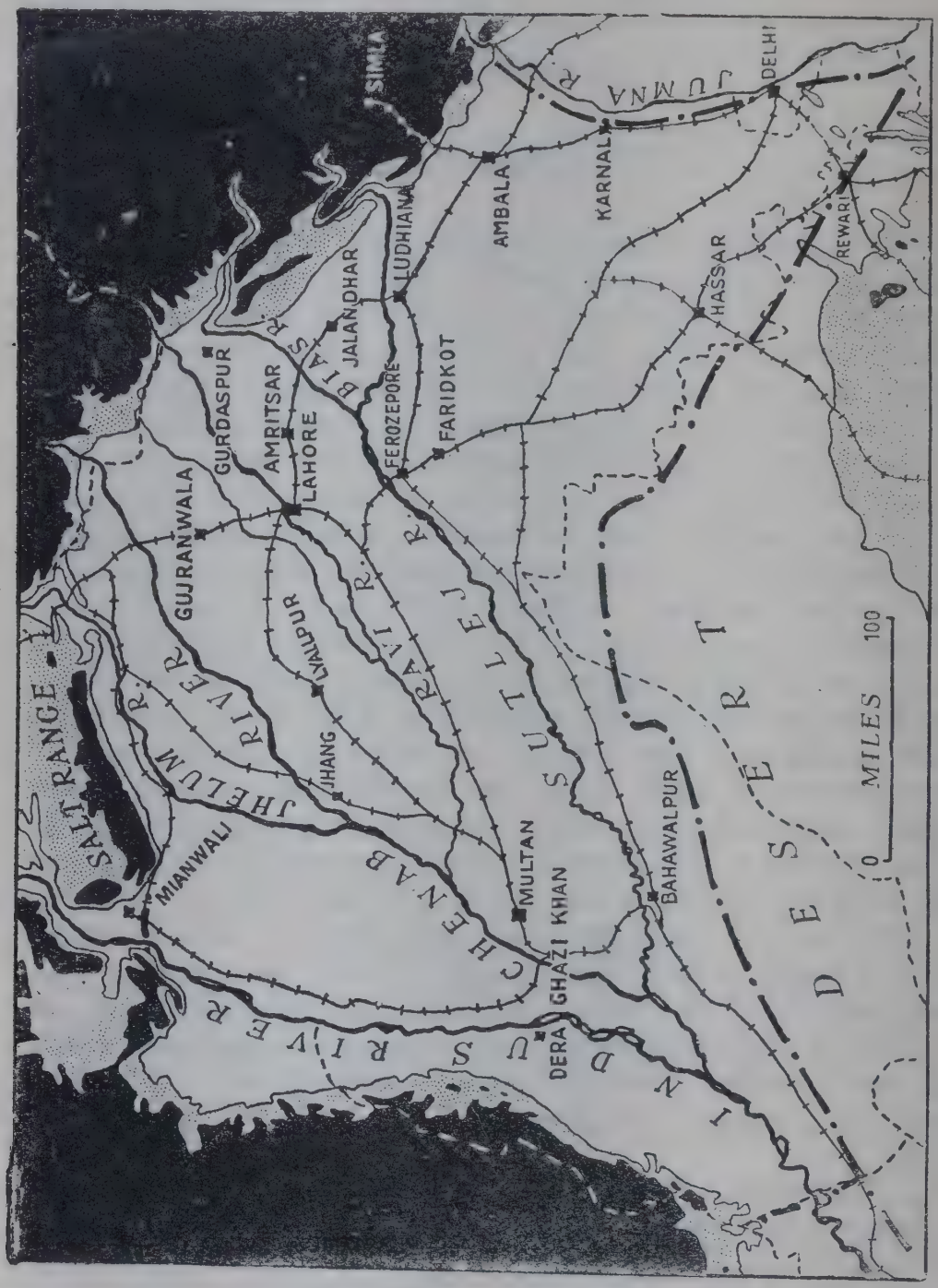


FIG. 52.—The Punjab Plains.
Land over 1,000 feet, dotted; over 2,000 feet, black.

slow but in the rainy season, when the warm sun has melted the snows on the mountains, and the monsoon rains

are pouring down on the Himalayan slopes, the rivers become rushing torrents often miles wide. The rush of the water does not always follow the same channel. The river may leave its old bed, and in a single night destroy miles of fertile fields, cutting for itself a new channel. Between the rivers there is usually a flat alluvial plain covered with cultivated fields. The land between two rivers is called a 'doab'. Sometimes the land rises a little between the rivers and is then very dry and covered with scrub. The regions near the Himalayas sometimes suffer from severe earthquakes.

3. The Punjab plain is a dry region. On the north-west it is sharply marked off from the hills by the Salt Range and in the north-east it stretches to the foot of the Himalayas. But to the south you must remember it is not divided off by a sharp line. South of the Sutlej River the land begins to rise very gradually and becomes drier and drier till it passes into the barren waste of the Desert Region. But there is no place where you can say 'Here the Desert begins and the Punjab Plain ends.' If we travel eastwards across the Punjab Plain we do not come to any hills but we find that we cross a line after which all the rivers and streams flow eastwards to join the River Jumna and not westwards to join the Sutlej. This water parting marks the dividing line between the two great river basins of Northern India—the basin of the Indus and the basin of the Ganges. This line divides the Punjab Plains from the Upper Ganges Plain.

Throughout the great Punjab Plain there is no hill at all, it is very nearly flat and only slopes very gently from the foot of the mountains towards the south-west.

In Chapters IV and V, we learned that this Dry Region is particularly hot in the months of May, June and July, because it receives no cooling sea breeze and the sun shines brilliantly on its level plains. We learned also that in the months of December and January the Punjab Plain is cooler, generally speaking, than other lowland parts of India, because level plains which are far away from the sea cool very quickly.

When we were studying the rainfall map in Chapter VI, we saw that the whole of this region gets less than forty inches of rain in the whole year. The driest part is in the

south-west and receives less than five inches, whilst the wettest parts are near the mountains. Why should this be so? In this book we are studying the driest regions of the whole of India but we must remember that many parts of India are very wet and India is, on the whole, a wet country. Another important thing to notice is that the east of England receives about the same amount of rain as the northern part of the Punjab Plain. Yet there is no dry region in England, because the rain falls gently and at all times of the year and the sun is not hot enough to dry it up quickly. In North-Western India the rain falls mainly at one time—in July, August and September—and the rays of the sun are very powerful in drying up the soil.

4. As a result of the small amount of rain falling during one part of the year only, the Punjab Plain would be a very barren region if man had not worked very hard to improve it. If the rainfall is not sufficient to nourish his crops, man must bring water to them artificially. Bringing water artificially to fields is called irrigation. In India there are four principal ways of irrigating the land.

(*a*) By wells. There is often water underground even when the surface of the land is dry. This underground water can be reached by wells. The Persian wheel is also used for raising the water and is very common in the Punjab.

(*b*) By tanks. In the wetter parts of India rain water is caught and stored for a few months in large ponds or tanks. But in the driest season of the year these tanks are dry also.

(*c*) By inundation canals. When the rivers are in flood some of the water is drawn off into canals, but later in the year these canals dry up.

(*d*) By permanent irrigation canals. These are by far the most important because they have water in them for the whole of the year.

From earliest times, the kings, rulers and people of the Punjab have built and used wells and canals in order to provide themselves with water. Since India became part of the British Empire, the Government has spent enormous sums of money in improving old canals and especially in building new ones. In the whole Province of the Punjab, which you must remember includes a large area of hills

and mountains, over 13 million acres are irrigated or 51 per cent of the whole. No less than 60 per cent of the crops grown are irrigated.

5. We find we can divide the Punjab Plain into three separate areas or sub-regions.

(*a*) The North-Eastern Plain. This is the wettest part (near the foot of the mountains) and has a rainfall of between 25 and 35 inches. A very large number of wells are found in this region and it is possible to grow many crops without canal irrigation.

(*b*) The South-Western Plain. This is the driest part and the usual rainfall is only from 5 to 10 inches. It is almost impossible to grow anything without irrigation.

(*c*) The South-Eastern Plain. Here the rainfall is from 20 to 30 inches but it varies very much from year to year. In good years many dry crops can be grown, but in bad years none.

You will see these three divisions of the Punjab Plain marked in Fig. 54.

Now look at Fig. 56 and see what a large proportion of the crops in the Punjab Plain are irrigated. Especially in the south-west nearly all the crops depend on Government canals.

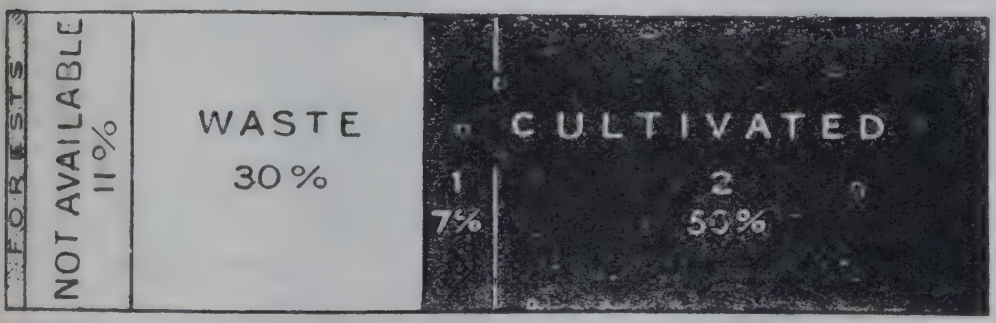


FIG. 53.—Proportion of cultivated land in the Punjab Plains.

Since Irrigation Canals are so very important let us study how they are arranged. Although the rainfall in the Punjab Plain is poor, there is a good rainfall, as well as a heavy snowfall, on the Himalaya Mountains to the north. As a result the rivers which rise in those mountains are never dry but are always bringing water down from the mountains to the plains. In some seasons of the year

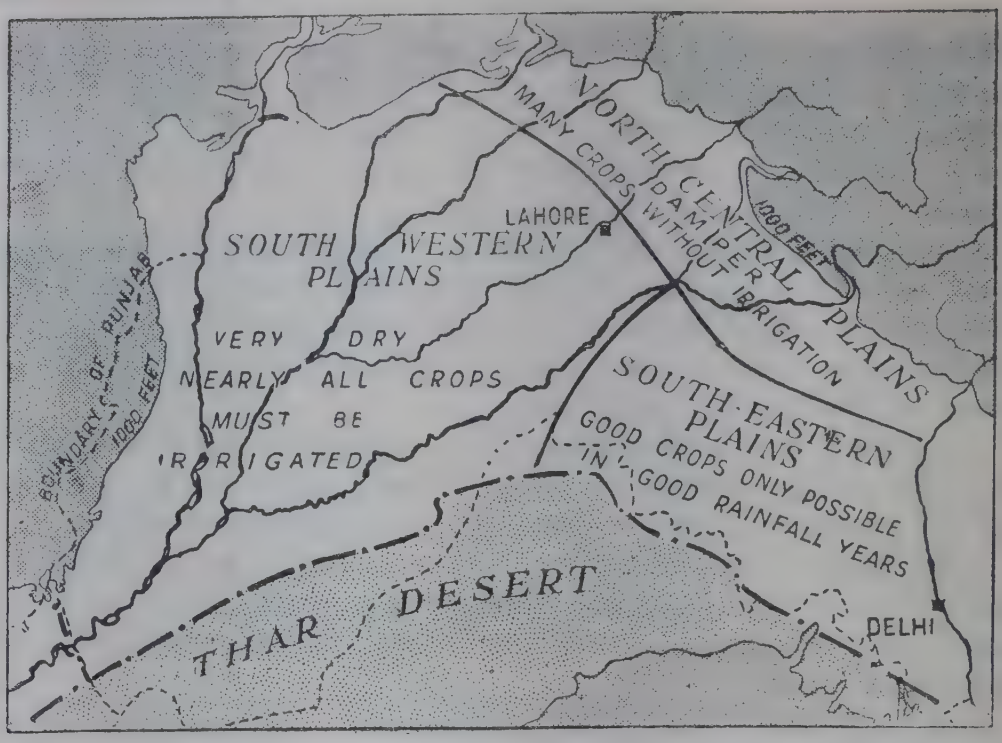


FIG. 54.—The three divisions of the Punjab Plains.

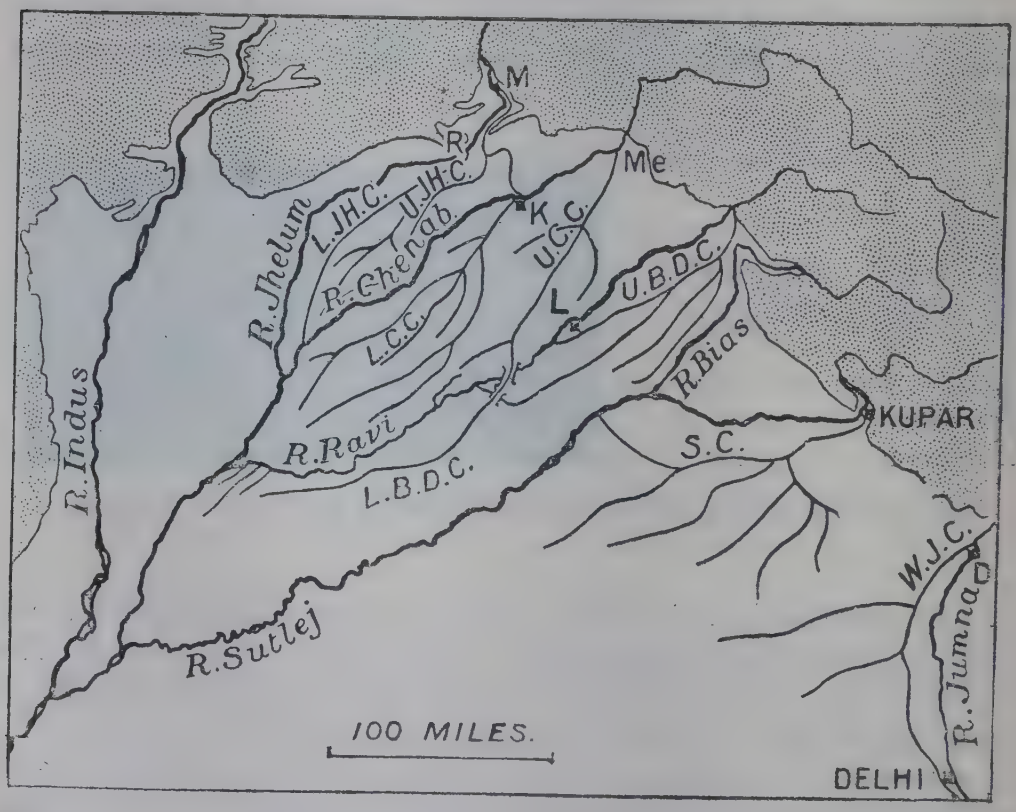


FIG. 55.—The Punjab Canals.

there is more water than at others. It sometimes happens that most water is required for irrigation when the river is at its lowest. The first stages in building a great irrigation canal are

(1) to choose a suitable spot on the river where its supply of water can be 'tapped'.

(2) to build across the river a wall (called a dam or weir) so that the water will collect behind and form a lake which will never be dry. In the rainy season more water

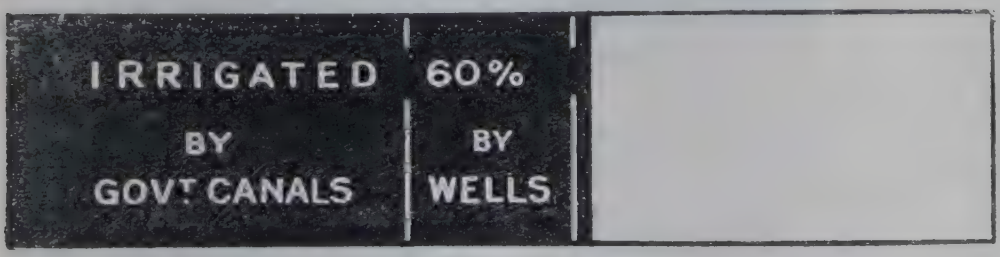


FIG. 56.—Proportion of crops irrigated in the Punjab.

will flow into this lake than is required and it is allowed to escape over the wall. But in the dry season nearly all the water in the lake will be used for the canal.

The dam or weir from which the canal starts is called the 'head' of the canal. The main canal is then cut right across the country. The slope of the canal is very, very gentle so that the water only moves slowly and not rapidly as it does in many rivers. Often the surface of the land slopes more rapidly than is desirable for the canal and so the canal has to be built upon an embankment. From the main canal big branch canals are constructed (see Fig. 55). The water is actually distributed to the land through a series of small side branches called distributary canals. The amount of water passing into these small canals has to be very carefully regulated.

In the Punjab Plains there are six very large and important canal systems. You will see the principal canals marked on Fig. 55. Study this map carefully and notice the big main canals and then the branches or distributaries. These are the main canal systems.

(1) The Western Jumna Canal takes the water from the Jumna, near where the river leaves the Himalaya

Mountains. This is an old canal which has now been rebuilt and much improved.

(2) The Sirhind Canal takes its water from the Sutlej River and like the Western Jumna Canal it waters the south-eastern part of the Punjab Plain.

(3) The Upper Bari Doab Canal takes its water from the Ravi River from near Madhapur, where the river leaves the Himalaya Mountains. It waters the Bari Doab, or region between the Ravi and Bias Rivers.

(4) The Lower Chenab Canal is one of the largest irrigation works in the world. A great weir was built across the River Chenab at Khanki and nearly $2\frac{1}{2}$ million acres are irrigated.

(5) The Lower Jhelum Canal takes its water from the Jhelum at Rasul.

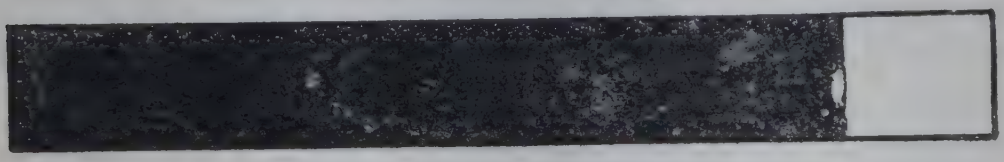
(6) The Upper Chenab—Lower Bari Doab Canal System. This system, also known as the ' Triple Project ' is one of the cleverest examples of irrigation in the world. The Upper Chenab Canal takes its water from the Chenab at Merala, at the foot of the Himalayas. The main canal is carried by an ' aqueduct ' or water bridge across the Ravi River and then becomes the lower Bari Doab Canal. But when this scheme was arranged, it was found that so much water would be taken by the Upper Chenab Canal that none would be left for the Lower Chenab Canal. And so the Upper Jhelum Canal was built, which brings water from the Jhelum to the Chenab at Khamki and helps to fill the Lower Chenab Canal. Hence the name of Triple Project. The great system has only recently been finished.

6. You can understand now that if the canals were destroyed, those parts of the Punjab which rely on them for water would be of very little use at all. But the canals cost a very large amount of money to build and keep in repair. Government has spent more then 22 crores of rupees in the Punjab Plains alone. If the canals were destroyed, thousands would perish of famine and one of the most fertile and thickly populated regions of the world would become practically a desert.

There is another important result of irrigation. It allows much of the land to be ' double-cropped,' that is two crops are grown on the same piece of ground in one year. Wheat is usually a ' winter crop ' ; other crops can be grown

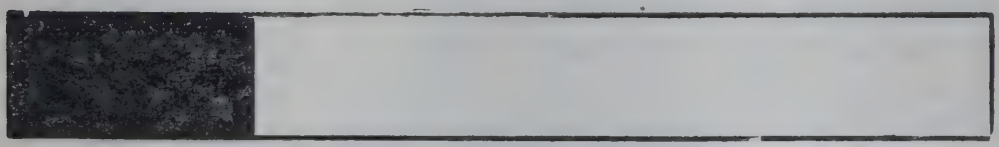
on the same land in the hot season and the rains. The two crops are called respectively 'Harri' and 'Saroni'.

Now let us learn something about the crops grown in this Natural Region. Read Chapter VII again carefully. You will find very important facts about the crops and vegetation of the Dry Regions of the Punjab.



In the very dry South-west.

In the damper Northern part.



In the slightly hilly South-east.

FIG. 57.—Proportion of crops irrigated in different parts of the Punjab Plains (irrigated crops in black).

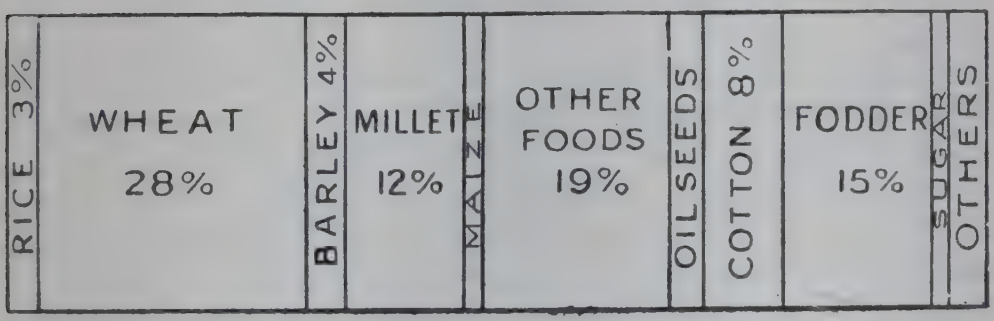


FIG. 58.—Crops of the Punjab Plains.

Now look at Fig. 58, the crops of the Punjab Plains. Notice the most important crop is wheat—occupying nearly one-third of the whole cultivated area. Another important crop is millet, often grown on the same ground as wheat,

the wheat being reaped in the Spring and the millet in the Autumn. Much millet, is also grown as a 'dry' crop where wheat cannot be grown. Wheat and millet, together with maize, form the staple food of the people. Owing to the splendid irrigation works in the Punjab, more wheat can be grown than the people require. Wheat is the principal food of many of the peoples of Europe where they cannot grow enough for themselves. So every year a large quantity of wheat is sent to the port of Karachi and from there by boat to Europe. Barley is another important crop and some of it is exported in the same way. Another crop grown largely for export is oilseeds. India uses a very great deal more sugar than she produces, but some sugar-cane is grown in many parts of India. In the area we are studying in this book most is grown in the north-eastern part of the Punjab Plain. By far the most important crop not grown for food is cotton. On the irrigated land of the Punjab much of the long-stapled American cotton is grown (see Chapter VII) and exported through Karachi.

In dry regions like the Punjab Plains, there is often not enough grass to feed cattle and so food (called 'fodder') has to be grown for them. Fodder is an important crop because the cattle must be kept for ploughing. There are large numbers of sheep and goats in this region. They live on the poor scrubland which is not good enough for cattle.

7. The larger number of the people in this natural region are engaged in agriculture. They live in small villages, scattered over the plains. Their huts are built of mud or mud and wattle, for there is little or no stone in the great alluvial plain. The roofs of the huts are flat (since there is little rain to run off) and made of rough branches coated with mud. In some parts of the world we find agriculture is carried on from isolated houses or 'farms', each house being some distance from the next. This is the case in Europe and America and also in the Ganges Delta. But in days gone by the peaceful cultivators of India suffered much from robbers who swept down upon them from the hills and so they lived together in villages for greater safety. In this region the people have not changed their habits and still live together in small villages. Out of every 1,000 people in this region only about 120 live in towns

of more than 5,000 inhabitants. In the Punjab Plains there are only seven towns with more than 50,000 people, and several of these are becoming smaller rather than larger. The largest and most important city is, of course, Delhi, the capital of India, which we must study separately. We can divide the other cities into two groups.

(1) The great cities of the past: famous religious centres or ancient capitals, such as Lahore, Amritsar (the old Sikh religious centre) and Multan.

(2) Cities of modern origin or old cities which have adapted themselves to modern needs and form collecting stations for agricultural produce or have developed manufactures of their own, such as Ambala, Lyallpur and Gujranwala.

Lahore is still the largest city of the province and an old capital. It is an important railway centre and no less than 30,000 people are supported by the railway industry. It is also the seat of Provincial Government. It is an educational centre with several colleges and a University.

Amritsar is a newer town than Lahore. During the eighteenth century it was the stronghold of the Sikhs who stood out against the Mohammadans. It suffers badly from fever, largely due to stagnant water which soaks into the surrounding hollow from the Upper Bari Doab Canal. It manufactures carpets and has other small manufactures but they are less important than formerly. There is a large Sikh 'Golden Temple', which is visited by many pilgrims every year.

Multan is the natural collecting centre for the south-west of the Punjab. It is a very old town, with old local industries. Afghan traders visit the town (see the map for the routes by which they come) and exchange their raw silk, fruits and spices for piece goods.

Lyallpur is a fine new town with a large wheat trade, the wheat being collected and sent to Karachi. It also has cotton mills.

Ludhiana manufactures cotton fabrics.

Gujranwala is an active trade centre.

Ambala is a modern town, of British origin, and a railway junction.

Patiala is one of the largest towns in a native state, and a trade centre for the South-eastern Punjab.

8. *Delhi*, the capital of India, is a large city of more than 300,000 inhabitants—the sixth largest city in India. It owes its importance to what we call the 'strategic' character

FIG 59.—The position of Delhi. T = The Thar Desert. Land over 1,000 feet dotted ; land over 3,000 feet black.

of its position. Look at Fig. 59 and notice that Delhi stands at the head of both the great plains—the great fertile plain of the Ganges and the great plain of the Indus. From Delhi any place in these great plains is easily reached. In days gone by, as you learn from your history, India was invaded many times from the north-west. The invaders had to pass through or near Delhi on the way : they could not go to the north because they were shut in by the Himalaya Mountains, they could not go to the south for there is the great barren waste of the great Indian Desert ; or the hilly dry lands of the Central Indian Plateau. So in the past Delhi has often been the capital of India. From it the rulers could easily reach and control all parts, but especially the fertile valley regions. Now also Delhi is the capital of India. Owing to irrigation the lands round about

are fertile and covered with crops. Much cotton is grown and finds its way to Delhi where cotton manufacture is carried on. Standing on the Jumna, Delhi is at the 'head of navigation' of that great river and boats can go all the way from Delhi to Calcutta. The land routes from the north-west there joined the water routes of the north-east. In modern times railways have largely replaced the land and river routes and Delhi has become a great railway centre; easily reached from all parts of India. At a convenient distance to the north, on the healthy heights of the Himalayas is Simla, the hot weather seat of Government. During the hot weather the Government moves from Delhi to Simla.

QUESTIONS AND EXERCISES

1. Describe the climate of the Punjab Plains.
2. Draw a sketch-map of the dry belt showing separately the parts producing most millet and those producing most wheat. How do you explain this distribution of crops?
3. Give an account, with sketch-maps, of irrigation in the Punjab.
4. Draw sketch-maps from memory illustrating the position of Multan, Lahore and Delhi.
5. Describe a journey from the Himalaya Mountains to Kathiawar.
6. Find another natural region in the world like this one.
7. Compare a day in the life of a villager living in this natural region with a day in the life of a villager living in the Himalayan Region.

CHAPTER XVI

THE LOWER INDUS VALLEY OR SIND

1. Sind has often been called the 'Unhappy Valley.' But when compared with some of the natural regions we study in this book, such as Baluchistan and the Thar Desert, it is a fortunate land. In the days of old, when India was invaded by the Greeks and the Arabs, the invaders had marched for long weary days and weeks through the desert wastes of Persia and Baluchistan and they thought the Valley of the Indus a most promising country.

Sind consists of a broad dry alluvial plain stretching from the edge of the Baluchistan Plateau on the west to the Thar Desert on the east. Running through the centre of the valley is its life and soul—the Indus River. Just as Egypt is the 'Gift of the Nile' so is Sind the 'Gift of the Indus.' In the last chapter we learnt something of the Indus River in the Punjab Plains. When it leaves the Punjab the river flows through a narrow rocky gorge. This gorge is important for several reasons. It separates the Punjab Plains from the Plains of Sind. The mighty river has here been crossed by a railway bridge (Rohri). It is here, just below the town of Sukkur, that the rocky bed of the river affords a good foundation for one of the largest irrigation dams in the world.

Sind is a very dry region. Look back at Fig. 29 and you will notice that part of it gets less than five inches of rain in the year. A little more falls near the coast, but it is still very, very dry. Sind would be quite a desert, if it were not for the River Indus from which water can be obtained to nourish the crops. You have learnt that the Indus is fed by the melting of the snows in the Himalaya Mountains far away and is not affected by the small rainfall in the lower part of its valley. Although Sind is *inside* the mountain wall of India, it is very little

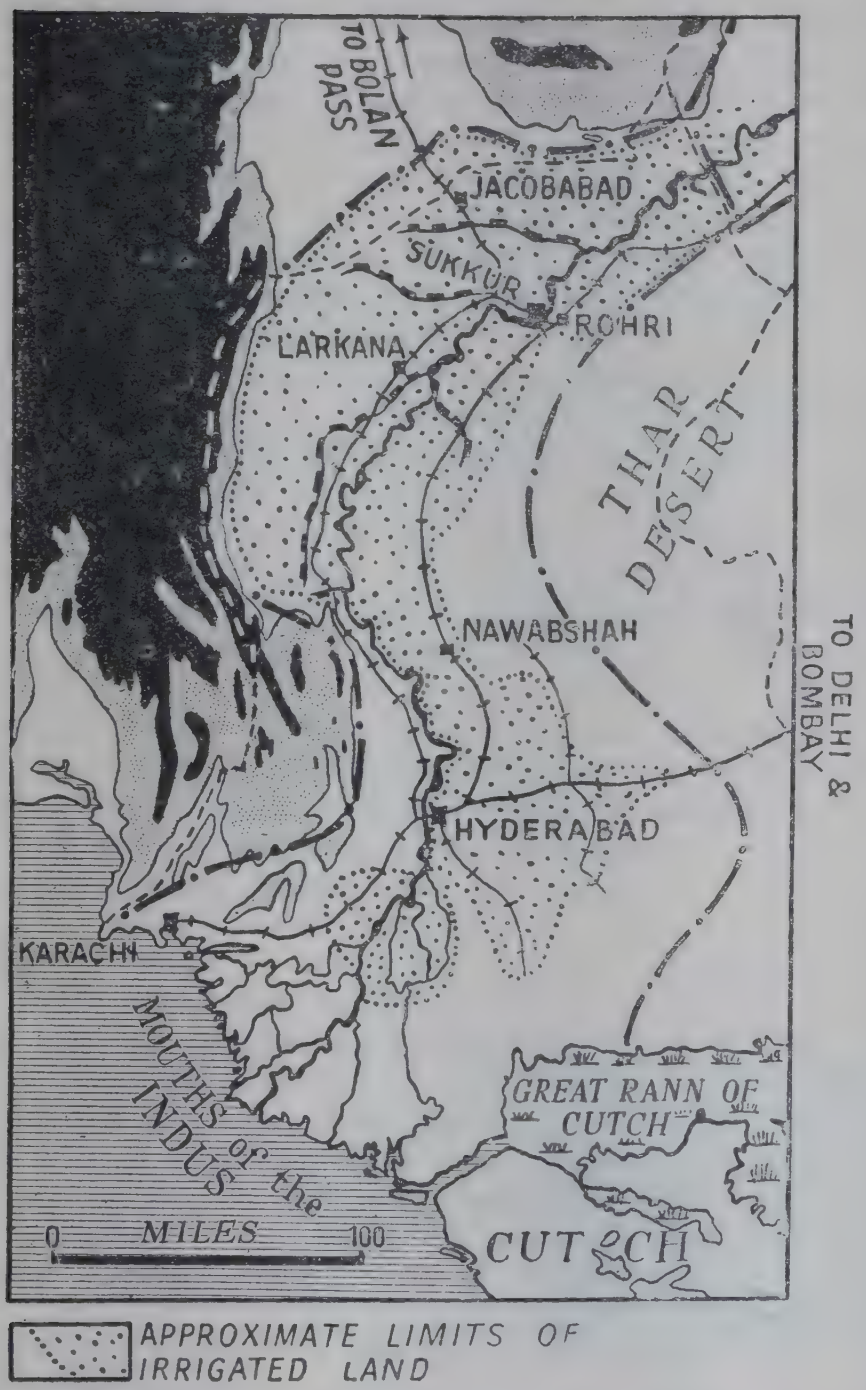


FIG. 60.—The Lower Indus Valley. Land over 1,000 feet dotted ; land over 3,000 feet black.

affected by the South-West Monsoon. The Delta of the Indus is not very far from the dry lands of Arabia and North-east Africa and the South-West Monsoon has not blown very far over the sea. It has not had time to gather very much moisture and even when it reaches Sind there are no mountains to cause it to rise and give up its moisture. Instead, it blows towards the still hotter and thirstier plains of the Punjab.

2. The rainfall in Sind is too small for crops to be grown without irrigation. For ages past irrigation has been practised in Sind, but it is different from that about which we have learned in the Punjab and also in Baluchistan. The irrigation in Sind is by means of 'inundation canals.' Canals are dug from the banks of the River Indus through the flat alluvial plain. They are filled with water when the river is in flood but later in the year they become dry. These canals do not, then, have water in them all the year round like the larger canals of the Punjab do. Study Fig. 60 and notice the area irrigated by the flood canals from the Indus.

Away from the irrigated land, Sind is a lonely, barren desert. Here and there are the remains of canals no longer used, the remains of cities which no longer exist. There are deep, dry valleys which were once occupied by branches of the Indus. Probably the main stream of the Indus once flowed much further to the east than it does now, and emptied itself into the Great Rann of Cutch. The old course is marked by a broad valley, but quite dry. The Rann of Cutch is an interesting region. Look at its position on Figs. 60 and 69. It was once an inland sea but it was gradually filled up by mud and sand (alluvium) brought down by the rivers. It is no longer an arm of the sea but merely a marshy area, almost dry in the Hot Season. It is still being filled up by sand blown from the Thar Desert and soon it will be dry, barren desert. We have learnt earlier in this book that the surface of the land is not steady. Sometimes parts sink and are covered by the sea and other parts rise. It was on the western border of Cutch that the people, in 1890, actually saw a huge tract, 2,000 square miles of land, sink below the level of the sea.

Look again at Fig. 60 and notice that the delta of the

Indus is not marked as irrigated. Other rivers in India have deltas—like the Ganges and the Irrawaddy —and their deltas are rich rice-growing regions, thickly populated. There is excellent pasture in parts of the Indus Delta, but much of the delta of the Indus, however, is a useless waste region, almost uninhabited.

Near the coast it is flooded by the waters of the river and sea in the Hot Season, and in the Cold Season is a waste inhabited only by wild birds. Further inland is a strip of desert where once flourished cities and ports.

3. A very great change will soon take place in Sind. In the last chapter you learnt of the great canal systems which have brought so much wealth and prosperity to the Punjab. For many years past there has been a great scheme to replace the poor 'inundation canals' of Sind by a great system of permanent canals with water in them all the year. This scheme, known as the Sukkur or Lloyd Barrage Scheme is one of the largest works for irrigation even attempted. A great dam or weir has been built across the River Indus below the town of Sukkur and the water of the Indus can now be stored up to fill a great series of canals, stretching right along the Lower Indus Valley. Study Fig. 64 carefully and notice where the canals have been made or are being made.

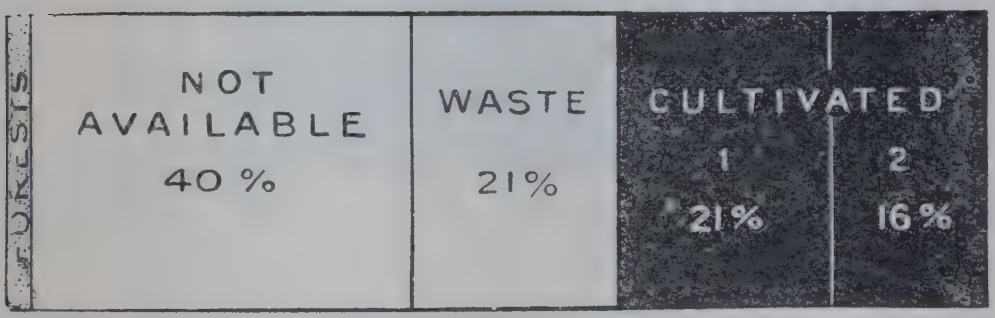


FIG. 61.—Proportion of cultivated land in the Lower Indus Valley.

4. Now let us look at the agriculture of Sind. Fig. 61 shows you the proportion of land which is cultivated, and

Fig. 62 shows you the crops which are grown. Rice, wheat, millet, and cotton are all important. Fig. 63 shows you the proportion of irrigated land in the Lower Indus Valley. There is so little rain that scarcely any 'dry' crops can be grown. Even millet has to be irrigated.

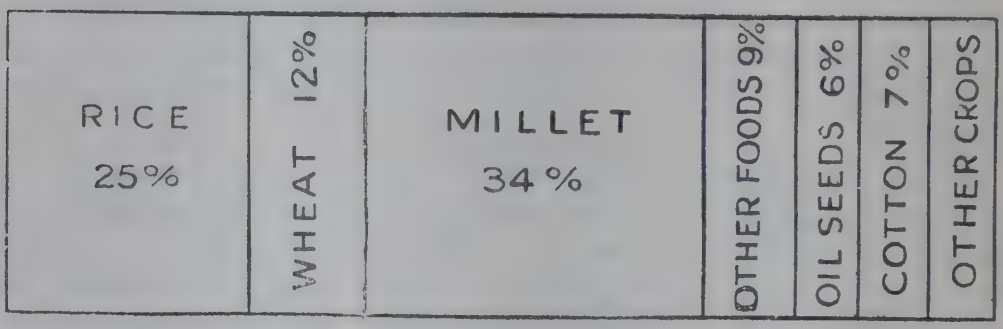


Fig. 62.—Crops of the Lower Indus Valley.

In the days of old the ports of Sind were small towns in the delta but they are now entirely replaced by the great port of Karachi. Karachi is situated to the west of the delta and on the extreme west of the natural region. You will learn that Karachi is the natural outlet for the whole of the Punjab as well as Sind and is rapidly growing in

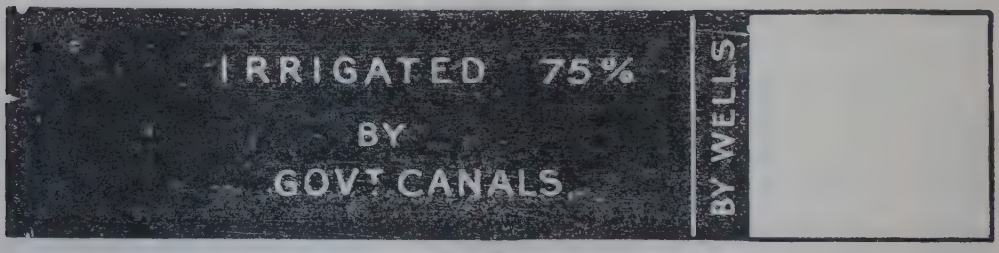


Fig. 63.—Proportion of crops irrigated in the Lower Indus Valley.

importance. From Karachi the railway runs to a point, at the head of the Indus delta, where the Indus can be bridged. On the east of the river is the important town of Hyderabad. From here there are two railways. One strikes eastwards, right across the desert into Rajputana and on to Delhi. The other follows up the valley to Rohri and on to the Punjab.

At Rohri there is another bridge across the Indus gorge to Sukkur. Notice also that another line from Karachi follows

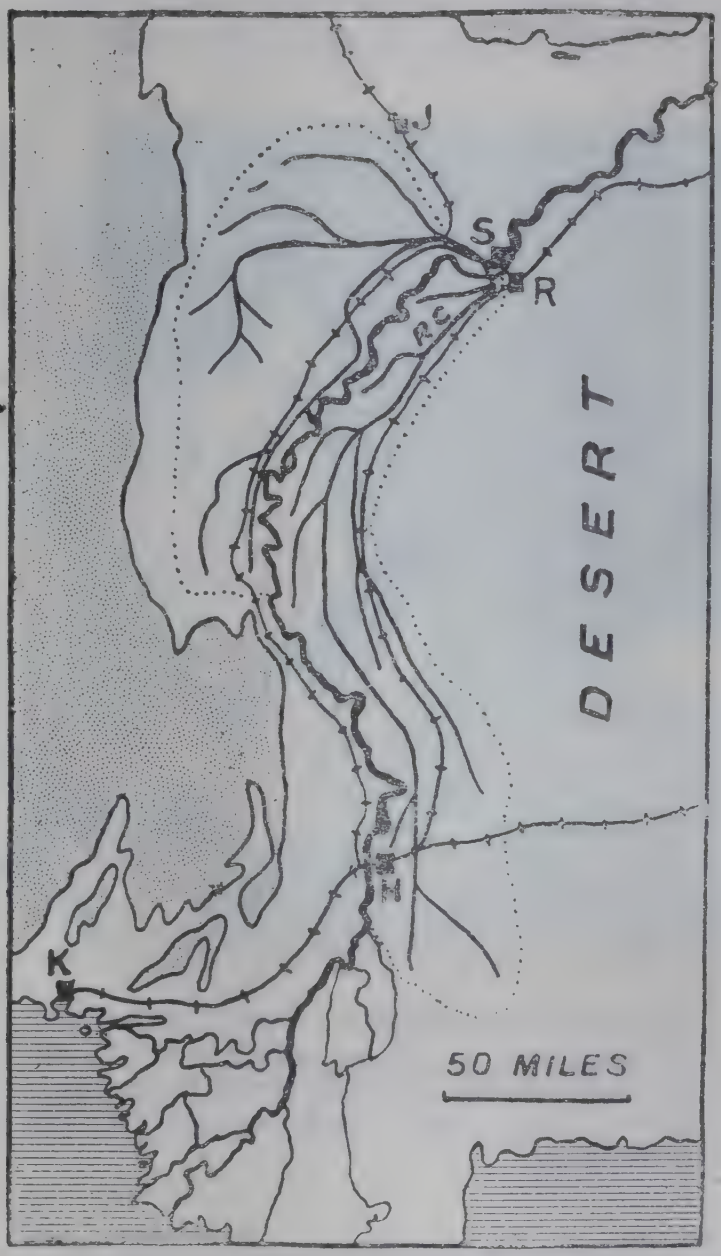


FIG. 64.—The Sukkur Irrigation Project.

up the western side of the river and connects with Quetta and Baluchistan, through the Bolan Pass.

Karachi is the great wheat port of India exporting the wheat of the Punjab. A great amount of cotton is also exported. Here is an interesting fact. Bombay also exports much cotton, but Bombay also has a large number of cotton mills where cotton cloths are made. Karachi exports cotton but cannot have cotton mills because the

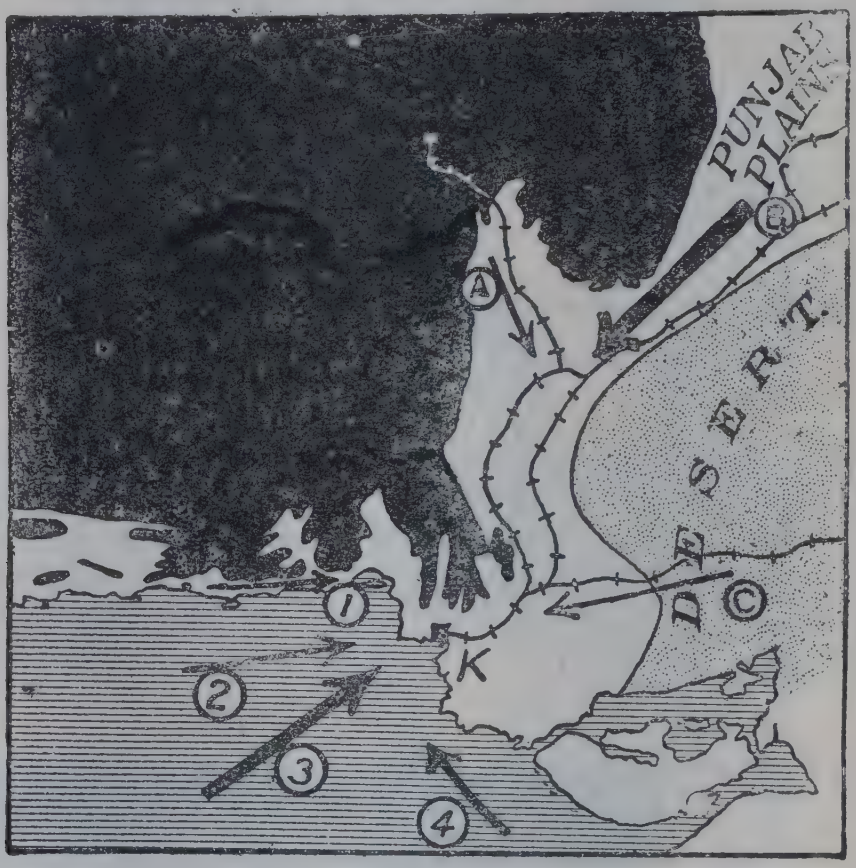


FIG. 65.—The position of Karachi. Land over 1,000 feet, black.
A. From Baluchistan, B. From Punjab, C. From Rajputana. 1. Land route from Persia. 2. Sea route from Mesopotamia and the Persian Gulf. 3. Sea route from Europe. 4. Sea route from Bombay and Colombo.

climate is too dry for cotton goods to be manufactured. The air must be a little damp for the proper working of the cotton fibres. The air in Lancashire (England) is just damp enough and so Lancashire manufactures some of the finest cotton goods in the world. This is an excellent example of the 'Climate Control' of man's activities.

QUESTIONS AND EXERCISES

1. Write a short account of the different kinds of irrigation in India.
2. Describe the climate of Sind.
3. Compare and contrast the Lower Indus Valley with Baluchistan.
4. Do you think Sind will increase in importance? Give your reasons.
5. Draw a sketch-map showing the importance of the position of Sukkur.

CHAPTER XVII

THE THAR DESERT [1]

Northern India is separated from Peninsular India by a long line of hills, running from west to east. Follow the line very carefully on your map. In the west it is called the Satpura Range, passing eastwards into the Mahadeo Hills and then the Maikal Range. Throughout the history of India this line has formed a very important barrier and has cut off the peoples of Northern India from those of Peninsular India. The part of India lying north of the range slopes, on the whole, towards the great plains of the Indus and Ganges. There are however lines of hills which interrupt the general slope. The two most important lines are the Vindhya Range and the Aravalli Range.

Notice now the position and direction of the Aravalli Hills—from south-west to north-east through the heart of Rajputana. The crest of the range is generally about 3,000 feet high, and from there the land slopes north-westwards, gently but irregularly, to the plains of the Indus. The Great Indian Desert occupies this sloping area. The Thar or Great Indian Desert may thus be defined as a vast dry area lying between the slopes of the Aravalli Range and the Indus Plains.

It consists of a sandy waste, interrupted by rocky hills and waterless valleys. The ground is often entirely bare, in some places there may be a few shrubs, or plants with thick fleshy leaves and stems which can store up water or with very long roots which can reach the moisture far below the surface.

The rainfall of the desert is generally less than 10 inches annually. Even this amount is very irregular and falls mainly during storms. In some years there may be no

[1] Comprising roughly the north-western part of Rajputana and the adjoining tracts of Sind and the Punjab.

rain at all. Notice, however, that the rainfall is greater than in parts of the rich Indus Valley. The Thar Desert remains a desert because there are no large rivers which can be used for irrigation. Even if rivers existed, the land is not flat and it is difficult to irrigate land unless it is flat.

Very few people live in this region. In the State of Jaisalmer, which lies in the centre, there are only four people in every square mile. Some of the people live in villages which spring up where there is a little water and a little millet and fodder can be grown. Often the water in the wells fails or becomes salt and the village has to be abandoned. Many people own camels and trade across the desert.

The railway from Karachi to Delhi runs along the southern border of the desert, and another railway cuts across the eastern end, but there is no railway or road through the heart of the desert. It is still a great barrier to the movement of man as it has been throughout Indian history. It can be crossed by camel routes and one of the principal centres is the little town of Jaisalmer. Bikanir is a small town towards the eastern end of the desert and noted for its manufactures of camel hair goods. Many carpets are made here. It is a flourishing city and increasing in size.

CHAPTER XVIII

THE RAJPUT UPLAND REGION[1]

1. In the last chapter it was explained that Northern India is cut off from Peninsular India by the Satpura line of mountains. From the north of that line, up to and including the Aravalli Range there is a large tract of upland country, hilly, mountainous or plateau. The northern half of this tract is occupied by the group of native states known as Rajputana, the language spoken is Rajasthani. Old, hard, crystalline rocks occupy this part. Further south we find the old hard rocks have been covered by great flows of lava, known as the Deccan Lavas. This southern half of the tract is occupied by the group of native states grouped as Central India (West). It is not always easy to decide into what natural regions a country should be divided, and here is an interesting case. The rocks and soil of this southern part are like those of the Deccan Lavas Region of Peninsular India, and so we can treat this southern area as part of the Deccan Lavas Region. But the Satpura line is an important barrier and general considerations link this southern part with Rajputana.

Look again at Fig. 66 and at the map of India in your atlas and notice that the Rajput Upland Region consists of :—

(*a*) the Aravalli Range.

(*b*) the network of forested hills of Southern Rajputana.

(*c*) the valleys of Eastern Rajputana.

(*d*) the Vindhya Hills and their northern slopes with the Mahlwa Plateau.

(*e*) the Narbada Valley.

2. The whole region receives less than 40 inches of rain. In the north-west the slopes of the Aravalli Range fade away into the Thar Desert. To the east the rainfall gradually increases and the region passes gradually into

[1] Comprising the whole of the south-eastern two-thirds of Rajputana —with both slopes of the Aravalli Range, the Province of Ajmer-Merwara and part of Central India (western division).

the Central Indian Foreland with more than 40 inches. The Rajput Upland is then, a dry region. It is also a hilly region and so irrigation is difficult. We find that crops depend mainly on rainfall. In good rainfall years the

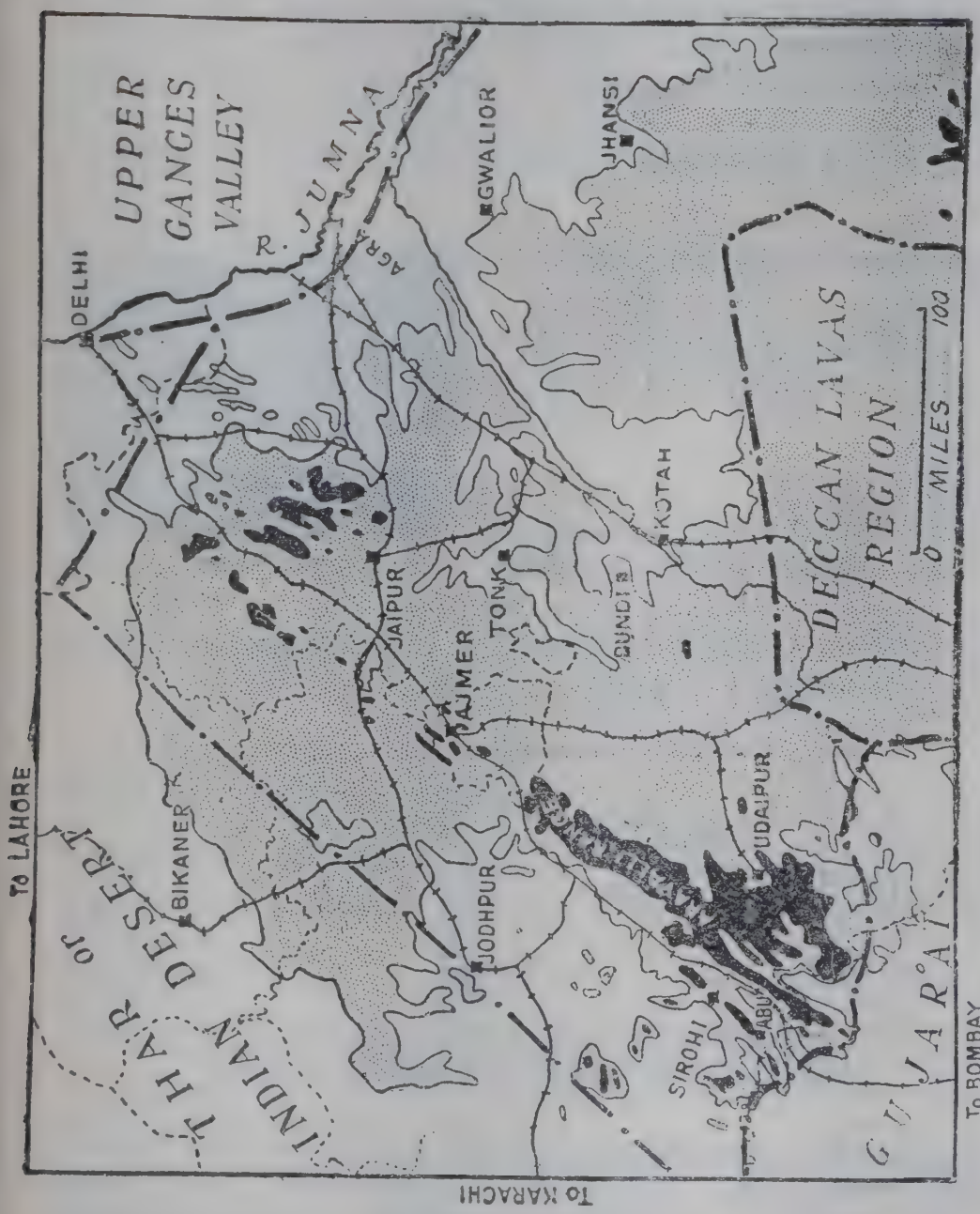


FIG. 66.—The Rajput Upland Region. Land over 1,000 feet, dotted; over 2,000 feet, black.

crops are good; in bad rainfall years the crops may fail entirely. There are two harvests, the Rabi and Kharif. Sometimes one may be bad and the other good. When both are bad, severe famine may result. The rain falls

mainly during heavy storms and the amount always varies greatly from year to year.

As a result of the irregular rainfall, not many people live in this natural region. In good years a great many more people could easily live here but in bad years even the few people there are have to get food from other regions.

3. Although the rainfall is only just enough for the growth of forests, the hills of Southern Rajputana—the home of the Bhils—are forest-covered. Fig. 67 shows you

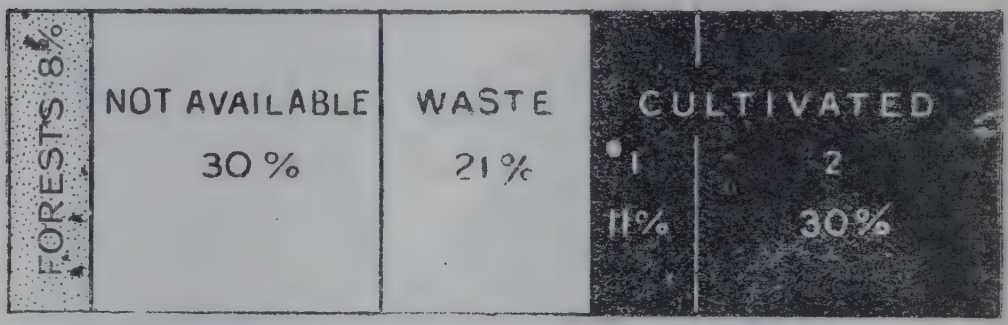


FIG. 67.—Proportion of cultivated land in the Rajput Upland Region.

the large proportion of waste land. The staple food of the people is millet, and gram for fodder. Study Fig. 68.

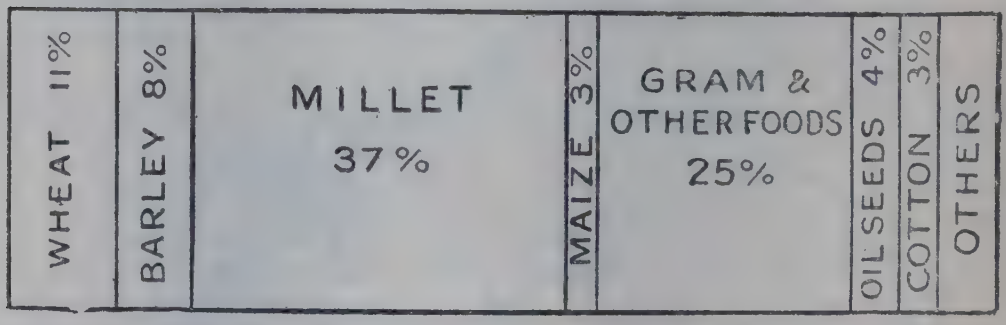


FIG. 68.—Crops of the Rajput Upland Region.

In the hilly forested parts of this region live the Bhils, a wild forest tribe. The Bhils still use bows and arrows. In other parts of the region the people are mainly Hindus and Rajasthani is their language. Rajputana is the great centre of the Jains. If we look at the occupation of the people we find far more are engaged in industry than in many other parts of India. That is because there are

important native industries—especially the making of cotton goods at Bikanir. Woollen goods, especially blankets, are made in most parts of Rajputana from the wool of sheep and goats. In the drier regions, bordering the Thar Desert camel hair is used and carpets, clothes, etc., are made.

4. This region lies between the fertile plains of the Upper Ganges and the regions of Peninsular India. So we find, although it is not very important or thickly peopled, there are several important railway lines running right through it. Along the northern edge, that is along the northern slopes of the Aravalli Range, is the line from Karachi to Delhi; further south is the line from Delhi to Bombay. To the east of the region is the line from Agra, through Jhansi to Bhopal and then joining the line along the Narbada Valley. The Narbada Valley is an important highway. Along it runs the railway from Bombay to Jubbulpore and on to Allahabad and Calcutta.

Ajmer, the principal town of the British Province of Ajmer-Merwara, is an important town of over 100,000 inhabitants. It is a flourishing city and steadily increasing in size with food and textile industries and railway workshops. There is a famous Mahommedan shrine which is visited every year by thousands of pilgrims. There is a Chief's College at Ajmer.

Jaipur is larger than Ajmer but is getting smaller. It has suffered much from plague and other diseases. It has textile and railway industries.

Abu is a small hill station at the southern end of the Aravalli Range. It is 5,000 feet above sea-level and has a rainfall of 60 inches although the plains near by have only 20 inches.

Jodhpur is on the borders of this region and the Desert.

Other cities in Rajputana owe their importance usually to their being capitals of states. They are not flourishing and tend to decrease in size.

Indore is the largest town in the Central India Agency and an industrial centre. Bhopal on the other hand has few industries and is getting smaller.

Lashkar and *Ujjain* are important towns in Gwalior, they have cotton and other factories. Gwalior town is on the border of this region and the Ganges Valley.

QUESTIONS AND EXERCISES

1. Draw a sketch-map of Northern India to show the lines of hills which separate Northern from Peninsular India.
2. Write an account of the climate of the Rajput Upland Region and its influence on agriculture.
3. Who are the Bhils? Describe their life and draw a little map to show where they live.
4. Draw a sketch-map of this natural region, marking the parts into which it may be divided.

CHAPTER XIX

THE GUJARAT REGION [1]

1. There are some regions which vary so much from place to place that they ought really to be divided up into a large number of very small regions. On the whole this region, Gujarat, is a lowland region, less than 1,000 feet above sea-level, but has numerous small hills. It lies between the highlands of the Rajput Upland Region and the sea and is really a coastal region. The great Peninsula of Kathiawar makes it much broader than the other coastal regions.

At the southern end Gujarat joins the very wet West Coast Region. At the southern end Gujarat is, therefore, a wet region but it quickly gets drier as one goes northwards. At the northern end it joins the Thar Desert and so is very dry indeed.

It will be simplest to divide the region up into five parts —South, Central and Northern Gujarat, Kathiawar and Cutch and briefly describe each.

2. *South Gujarat* is the wettest part of the region and joins the West Coast Region. Along the coast the climate is equable and healthy. There is a narrow strip where the soil is salt and poor and the water brackish ; behind this is a broad strip of rich black soil very suitable for rice and the best kind of cotton, sugar-cane and many other crops. The land is thickly populated, the people rich and flourishing. Farther inland hills appear, covered with forest. Forest and thick jungle cover large areas. In these inland parts the soil is poorer, cotton and poor rice are the most important crops. The eastern parts of South Gujarat are still wilder, more than half is covered with dense unhealthy forests inhabited by primitive tribes, and the whole is only

[1] Comprising the Gujarat Division of Bombay Presidency, with Kathiawar and Cutch ; the whole of the State of Baroda and adjoining Native States of the Bombay Presidency.

thinly peopled. Try and remember the remarkable change as you go inland from the coast.

3. *Central Gujarat* is much drier, and the 40-inch rainfall line passes through it. Rice can be grown on the low lying stretches of alluvium bordering the rivers, but millet and cotton are more important. The black cotton soil is found in the south. The eastern parts are more hilly and

FIG. 69—Gujarat. Land over 500 feet, dotted ; land over 2,000 feet, black.

much covered by scrub. The climate in this part of Gujarat is healthier and so the area is more thickly populated than South Gujarat.

4. *Northern Gujarat* is still drier, and is on the whole a flat region with a poor sandy soil. Wherever the soil is richer the population is dense and much millet is grown ; the poorer sandy parts are inhabited by primitive peoples

such as the Kolis, who in times past used to plunder their richer neighbours. Irrigation is not very important since few of the streams flow all the year. Cultivation is protected by tanks in this region.

5. *Kathiawar* is a large peninsula suffering from a precarious rainfall. In the centre is a group of forest-covered hills—the Gir Forest—among which most of the rivers have their source. These forests yield valuable timber. A large part of the rest of Kathiawar is a barren land of very little use. Over large areas the bare rocks rise to the surface and are not covered by any soil ; between the rocky ridges are barren, sandy valleys. Here and there are a few more favoured spots, almost like oases in the desert. The people and their villages are concentrated in these richer areas, such as around Jamnagar, or in the cotton-growing tracts near Dhari. Wherever irrigation is possible in Kathiawar, wheat becomes an important crop. Porbandar Stone, a limestone much used for building in Bombay, is quarried along the coast. There are salt deposits along the coast. Lime is made from the limestones and lime may become a source of wealth.

Politically Kathiawar consists of a large number of small native states. The principal towns are capitals of the states.

6. *Cutch* is surrounded on three sides by the great marshy useless tract known as the Rann of Cutch, and on the remaining side lies the sea. Like Kathiawar it is for the most part a barren, rocky, treeless and useless country, still drier than Kathiawar. It might almost be counted as part of the Thar Desert which lies to the north.

7. Running through Gujarat from south to north is the main line of the B.B. and C.I.R.—from Bombay to Delhi. The most important towns—Daman, Surat, Baroda and Ahmadabad lie on this line. From Ahmadabad a branch runs into Kathiawar and most of the larger states have their own railways.

Daman in Southern Gujarat is a Portuguese possession.

Surat is a large and important town in Southern Gujarat, near the mouth of the Tapti River. Before the rise of Bombay, it was the leading town of the West Coast. The first factory of the East India Company was at Surat. The town has now nothing like its old importance.

Baroda, the capital of the important State of Baroda, has modern cotton mills. It is also a large railway junction.

Cambay and other towns round the Gulf of Cambay are less important than formerly. The great cotton mills of the towns such as Bombay are replacing the small local industries and there is no longer an export trade from the small sea ports of the Gulf. Instead the trade goes to the great port of Bombay.

Ahmadabad is the great collecting centre of Northern Gujarat and stands high amongst the important cities of India. It has mills and is also a railway junction.

The towns of Kathiawar exist as collecting centres in the more fertile spots of the Peninsula.

QUESTIONS AND EXERCISES

1. Draw a sketch-map of this region showing the parts into which it may be divided.
2. Write an account, illustrated by sketch-maps, of the climate of Gujarat.
3. What is meant by the Climatic Control of Agriculture? How is the control seen in Gujarat?

CHAPTER XX

THE POLITICAL DIVISIONS OF NORTH-WESTERN INDIA [1]

1. The great Indian Empire is ruled by the Government of India, at the head of which is the Viceroy or Governor-General. The Viceroy is assisted by a small Council so that the acts of the Government of India are always said to be by order of 'The Governor-General in Council'. The Viceroy and Council are advised in all matters, but especially in the making of laws, by the Legislative Assembly, a large body of men elected by the people themselves in all parts of the country. Although the Government of India with its Legislative Council is the real means of Government in India, many matters have to be referred to the Capital of the British Empire, London, where they are administered by the Secretary of State for India. As you will learn from your history, a great part of India used to be controlled by the East India Company. When the possessions of that company were taken over and the Government of India was formed, the proclamation declared that 'all shall alike enjoy the equal and impartial protection of the law' whatever their race or religion and that all offices in the Government should be open to all natives of India, whatever their race or creed. Education, ability and integrity are the only qualifications required for Government service.

Since 1912 the seat of Government or Capital of India has been Delhi. For many years before that it was at Calcutta.

[1] This chapter is written primarily for the benefit of teachers. In the school curricula of the different Provinces there is usually an insistence that a study of the province in which the school is situated shall serve as an introduction to the whole of India. The teacher is advised to work steadily through Chapters I to IX in this book. Thereafter it is better to work through the *whole* of Chapters X to XIX which form a connected whole, but the teacher may, if so desired, select for study just those natural regions falling within the province concerned.

2. It would be very difficult to govern a huge area like India from one centre such as Delhi, so the Indian Empire has been divided into a number of provinces. The nine major provinces of Madras, Bombay, Bengal, the United Provinces, the Punjab, Burma, Bihar and Orissa, Assam and the Central Provinces are ruled each by a Governor assisted by a Legislative Council (elected mainly by the people); the six minor provinces are each administered by a Chief Commissioner.

Then there are large areas of India, called Native States, ruled by their own chiefs (styled Maharajahs, Rajahs, etc.). Generally the ruler is advised by a political officer appointed by the Government of India, but the native ruler otherwise has complete control of his affairs. Some of the Native States are very large, others embrace only a few square miles.

Included geographically in India are certain entirely independent states like Nepal. Quite separate in Government is Ceylon, which forms an island off the south of India and only separated from it by a narrow strait.

3. *Kashmir.*—Kashmir forms the northern part of the area studied in this book. It is a very large natural state, ruled by the Maharaja of Kashmir and Jammu. The whole of Kashmir is mountainous, the north-eastern part belongs to the Trans-Himalayan or Tibetan Plateau (Chapter XII), the greater part of the remainder is the Himalayan Region (Chapter X) with a strip belonging to the Sub-Himalayan Region (Chapter XI).

4. *Punjab.*—The Province of the Punjab is ruled by a Governor, and is divided into divisions under the control of Commissioners. Each division has again been divided into districts, in charge of Deputy Commissioners and each District comprises a number of tahsils. Included in the Punjab are several very important Native States, which have political relations with the Punjab Government. Along the south are Patiala, Jind and Nabha (the three Phulkian States) each ruled by a Maharajah; and the Mohammadan State of Bahawalpur. In the mountain regions of the Himalayas are the Native States of Chamba, Mandi, the Simla Hill States and others. The north-eastern projection of the Punjab, with the Hill States, belongs to the

Himalayan and Sub-Himalayan Regions (Chapters X and XI), the north-western part (districts of Jhelum, Rawalpindi,

FIG. 70.—Political Map of North-Western India. 1=Native States having relations with the Government of India direct ; 2=Native States having political relations with the Provinces.

Attock and part of Mianwali) to the North-Western Dry Hills (Chapter XIII), the remainder of the Punjab lies in the

great natural region of the Punjab Plain (Chapter XV), which we have divided into three parts.

5. *The North-West Frontier Province.*—The North-West Frontier Province consists of five British Districts, Dera Ismail Khan, Bannu, Kohat, Peshawar and Hazara. Between these and the frontier of India is a broad fringe of tribal territory which is not really governed by India, except to prevent the native tribesmen from raiding the peaceful peoples of the plains.

The greater (central) part of the province (which is ruled by a Chief Commissioner) lies in the North-Western Dry Hills Region (Chapter XIII) with a tongue stretching northwards into the Himalayan and Sub-Himalayan Regions (Chapters X and XI) to which Hazara belongs. The District of Dera Ismail Khan really forms part of the dry south-western division of the Punjab Plain (Chapter XV).

6. *Baluchistan.*—Baluchistan comprises the British districts of Quetta, Sibi, Chagai and others and the very large Native State of Kalat as well as a number of smaller states. The whole forms the Natural Region of Baluchistan (Chapter XIV).

7. *Sind.*—Sind forms part of the Bombay Presidency. Except for a strip on the east which belongs to the desert, it corresponds with the Lower Indus Valley (Chapter XVI).

8. *Rajputana.*—The very large area comprising Rajputana, or the Rajput Native States, falls mainly into two natural regions. The north-western part lies in the Desert (Chapter XVII) the larger south-eastern part in the Rajput Upland. There is no line between these two natural regions, the land of the Rajput Upland slopes gradually to the north-west, the soil becomes drier and less fertile and passes gradually into the desert.

9. *Bombay Presidency.*—(Northern part, not including Sind.) This area, together with the important Native State of Baroda, and the States of Kathiawar forms the natural region of Gujarat.

CHAPTER XXI

COMMUNICATIONS

1. Having completed the study of the Natural Regions of North-western India, we see that they differ from one another in physical features and in climate, and that, therefore, they produce different crops. We have seen how one region is specially suited to the production of a crop required by many of the other regions, as the Punjab Plains produce cotton for making the clothes used in all parts, or the various hilly regions produce timber for building. Also a region may produce a crop grown largely for export to other countries, as the Punjab Plains produce wheat. We have now to consider the means by which the regions share their productions with one another, or send them to other parts of India or out of India and get foreign goods in exchange. This chapter, therefore, deals with the means of communication. They are rivers, railways, roads and canals.

2. When goods have to be sent from one place to another, two things must be considered : (*a*) the cost of the journey ; (*b*) whether the goods will suffer damage on the way. Generally speaking, the cost of the journey is by far the most important consideration. The only cost which has to be thought of it things are sent by river is the wages of the men who row or sail the boat. In the case of a railway, the cost is very much more, because a railway costs a very great deal of money to build, and, in addition, there is the cost of the trucks and engines, and the wages of men employed on the line. If goods are sent by road, there is not only the wages of the man who drives the bullocks or horses, but also the cost of the animals' food. A horse can pull about one ton of goods along an ordinary road, but he can drag a boat laden with forty tons along a canal. We can therefore arrange the various means of

transport in order of cost, beginning with the cheapest—river, canal, road, railway. When it is important that goods should travel quickly, then the railway becomes the most important.

3. Looking again at Chapters I and II, we see that North-western India is plentifully supplied with rivers, and, owing to the low cost of river transport this was the most important form of communication. Except in the Vale of Kashmir we shall see that rivers are not nearly so important as formerly. The numerous canals of the Punjab Plains are used for irrigation but they are very little used for transport. In England and other parts of Europe the canals are used entirely for transport. There are now a number of good roads, and the greater part of North-western India is covered with a great network of railways.

4. From earliest times the River Indus and its tributaries formed the great highways. Railways have now replaced the rivers to a very large extent. The waters of the Jumna, Sutlej, Ravi, Chenab, Jhelum and Indus are now more usefully employed in irrigating the land but as a result there is little water left in the rivers and they are much less used for transport.

5. Roads are of two kinds, ' metalled ' and ' unmetalled.' You have probably seen a road being repaired and have watched the workmen spreading broken stones on the surface and then sand ; finally a heavy steam-roller crushes the whole surface flat and makes it smooth. A road made in this way is a ' metalled ' road, so called because the name given to the broken stone used is ' road metal '. You have seen also the rough roads between villages, dusty in the hot weather but thick with mud or even covered with water in the rains. No ' road metal ' is used for these roads and they are thus termed ' unmetalled '. Metalled roads are expensive to build and keep up. There are fair numbers in North-western India ; some are kept in repair by the Public Works Department of the Government (P. W. D.) others by District Boards. In the towns the roads are built and maintained by the municipal boards. It is fortunate that in the plains there is a good supply of hard ' kankar ' (see Chapter III) which makes excellent road metal.

There are several very important roads. One is the Grand Trunk Road from Calcutta through Delhi to Peshawar commenced in 1828–1835 before railways were invented and finished in 1863–64.

A branch of this road runs from Lahore to Ferozepore and joins the main road at Ludhiana. Then there is the fine mountain road from Ambala through Kalka to Simla, but now the railway runs to Simla, it is less used. It is, however, continued from Simla for 150 miles to the Shipki Pass on the borders of Tibet. Another hill road runs from Rawalpindi to Murree and on to Baramula, through the Kashmir Valley to Srinagar. There is also an important metalled road into the North-West Frontier Province from Peshawar to Kohat, Bannu and Dera Ismail Khan.

Except in the drier parts where camels are used, bullock carts are the chief means of transport on the roads of the plains.

There are numerous 'unmetalled' roads between villages all over North-western India. As their surface is not hard, it quickly becomes full of ruts and the 'roads' become difficult even for bullock carts. The 'roads' in the hilly regions are often mere tracks, wide enough only for pack mules. It is very expensive to construct a metalled road in the plains, for great care is required to get a good foundation. It is no use piling broken stone on a soft stretch of sand. A metalled road must have a good foundation first. In the hills there is plenty of stone, but the roads often have to be made to wind over hills and portions of the hills may need to be cut away before the road can be built.

6. By far the most important means of communication are the railways. You all know that railway trains run on 'lines'. Perhaps you have noticed if you have been far in India that all the railway engines—and carriages—are not of the same size. The most important thing of all in size is the distance between the two railway lines. If the lines are close together we can only have small engines and small carriages and travel slowly. If the two lines are far apart the engines and carriages can be much larger and can travel much more quickly. The distance between the two rails is called the **'gauge'**.

In India there are two very important gauges, and two others much less important. The important ones are :—

(1) The Broad Gauge. The two lines or rails are 5 ft. 6 in. apart and the engines are big and heavy and the trains can travel very quickly. But the broad gauge railway is very expensive to build and the trains cost a lot of money to run.

(2) The Metre Gauge. The two lines or rails are one metre or 3′ 3⅜″ apart. The engines are smaller and the trains are smaller and do not travel so quickly but they are less expensive to run. The metre gauge railway is less expensive to build and it has another advantage, the lines can be made to go round much sharper bends and curves than the broad gauge railway.

Then there are two smaller gauges 2′ 6″ and 2′ which are used for local railways and hill railways.

There are nearly 38,000 miles of railway in India. Nearly half is broad gauge and rather less metre gauge. You should remember that in Europe and a great part of America quite a different gauge is used—called the standard gauge. The rails are 4′ 8½″ apart.

7. You will learn in the next chapter that the whole of the great rich area we have been studying in this book has only two ports—only two outlets to the sea through which goods can be exported and other goods received in exchange. One of these ports, Bombay, only serves a small part of the area we are studying in this book and so Karachi is really the important port in the region. We can say then that the whole of the great fertile plains of the Punjab are included in the ' hinterland ' of the port of Karachi.

We will study now the railways of North-western India in order. Let us take first the railways which serve the port of Karachi. From Karachi the broad gauge line of the North-Western Railway runs to Hyderabad where it branches. One branch runs right across the Great Desert and into the Rajput Upland Region, through Jodhpur till it joins the main line of the Bombay-Baroda and Central India Railway from Bombay to Delhi. There is a junction just before Jodhpur from which passengers can go direct to Bombay. This railway across the desert connects Karachi with Delhi and Karachi with Bombay.

The other branch from Hyderabad follows the Indus

Valley into the Punjab. At Rohri Junction a branch line crosses the Indus, passes by Sukkur and runs up through

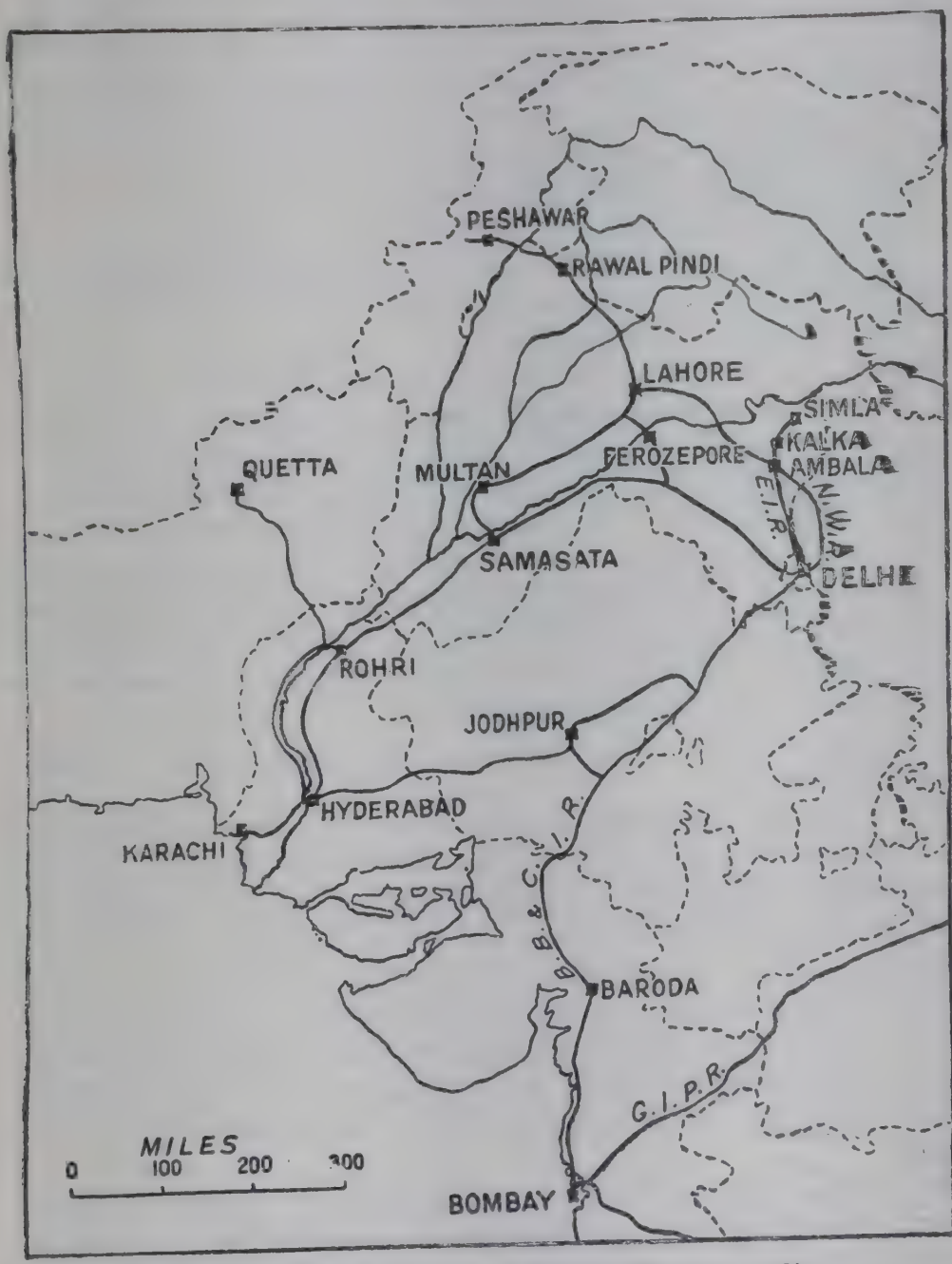


Fig. 71. The Railways of North-Western India.

the Bolan Pass to Quetta in Baluchistan and on to the border of Afghanistan.

At Samasata Junction in the Punjab the main line from Karachi branches, one line crosses the Sutlej to Multan and Lahore, the other continues as the Southern Punjab Railway and curves round the north of the Indian Desert to Delhi.

Now let us look at the network of lines in the North Punjab Plains. Delhi is directly connected with Calcutta by the East Indian Railway (E. I. R.) and with Bombay. From Delhi to Lahore there are three routes.

(*a*) N. W. R. through Ferozepore.
(*b*) N. W. R. through Ambala.
(*c*) E. I. R. to Ambala and then along N. W. R.

From Ambala a line runs to Kalka in the foothills, where the hill railway to Simla starts.

From Lahore the main line runs to Peshawar, crossing the Jhelum at Jhelum and the Indus at Attock. There are important branches along the south of the Salt Range; down the Indus Valley through Mianwali and across the Indus to Kohat and Bannu. No railway to Bannu is reached by a ferry across the Indus. All these railways are part of the N. W. R. and most are broad gauge. Like the greater part of the railways in India, they are only single lines and trains can only pass at the stations. There is a double line between Lahore and Saharanpur.

You should note the numerous important railway bridges over the rivers.

8. Now let us look at the Railway Time-tables and see what we can learn about the distances between places and the time it takes to travel between them. Suppose we wish to travel by Express train from Peshawar to Calcutta through Delhi. We can leave Peshawar at 10 o'clock at night on Monday and reach Rawalpindi at 6 in the morning. Then we pass through the plains and reach Delhi at midnight and by Thursday morning we arrive at Calcutta (Howrah) having travelled 1501 miles in $56\frac{1}{4}$ hours or nearly 650 miles a day.

Big ocean steamers only travel about 300 or 350 miles in one day and you will see how much quicker the railway is.

Now let us make another journey—from Bombay to Delhi, again on a broad gauge railway. The distance is 957 miles and it takes us $31\frac{1}{2}$ hours, or about 740 miles a day. If we want to go on to Simla from Delhi we can go as far as Kalka on the broad gauge and then we have to

change on to the tiny mountain railway with its 2 feet gauge. From Kalka to Simla is only sixty miles but it takes over six hours, for we are climbing the whole time.

9. In Chapter II you learnt that India is shut in on the north and west by a wall of mountains. Notice that no railway cuts through that wall to the north. To the north-west three railways climb part of the way up the wall; one through Peshawar and the Khyber Pass and other through Kohat to Thal and another to Bannu. One railway climbs through the wall into Baluchistan, through the Bolan Pass.

We find, then, that the railways in North-western India are limited (*a*) by mountains, (*b*) by broad rivers and (*c*) by deserts.

QUESTIONS AND EXERCISES

1. How would a man travel from Dwarka (in Kathiawar) to Peshawar? From Jaisalmer (in the Indian Desert) to Srinagar? Why would he travel the way you suggest?

2. If on an average you can travel 600 miles a day by train, 200 miles a day by motor car and fifteen miles by camel or mule, how long it would take to reach the following places from Delhi and how would you go? Leh (Kashmir), Kabul (Afghanistan), Gwadar (Baluchistan) and Srinagar.

3. Is there any reason for the direction followed by the railways from Karachi?

4. Draw diagrams to show the importance of the position of Rohri (Sukkur), Attock, and Ferozepore.

5. What is meant by 'hinterland'? From memory draw a sketch-map of the hinterland of Karachi.

6. Explain the advantages of improving means of communication and illustrate your answer from what has happened in your own district.

CHAPTER XXII

TRADE AND RELATIONS WITH THE EMPIRE

1. In this book we have now studied the characteristics and products of the natural regions of North-western India. We have learned that different parts of the country produce different crops, and sometimes one province grows much more of one crop than it needs and wishes to exchange for some crop or manufactures from another province. In India, then, we have a considerable trade between the different provinces. We must remember, however, that the provinces are only part of the great Indian Empire and the Indian Empire is a member of a great family of nations, namely, the British Empire, or as it is sometimes called, 'The British Commonwealth'. In this chapter we have to see what part one portion of India plays in the world and the British Empire.

2. First we must understand what is meant by foreign trade. No civilized country produces everything which it requires. The cities of India would seem very strange now without any motor cars, or if we could not buy such things as machinery, glass, fine cotton goods and silks or boots and shoes. These things cannot all be made here, they have to be obtained from other countries. Now nearly all countries can produce more of certain things than they require. Such surplus products can be sent to other countries in exchange. Products which one country sells or sends in exchange to another are called 'exports': goods which the country buys or receives in exchange are the 'imports'.

It is very much better if the exchange of goods is between different countries of the Empire, for those countries stood together in the Great War, and they stand together in peace, and it is by the exchange of goods that they can help one another. India's trade, as we shall see shortly, is mainly with other countries of the Empire.

3. We will now study in particular the things of which the north-western part of India produces more than she

needs, and so exports or sells to other countries. The whole of the great Punjab Plain and Indus Valley and indeed nearly all the area we have studied in this book forms the 'hinterland' of the great port of Karachi. In recent years Karachi has increased greatly in importance. After Bombay and Calcutta it is now the third port of India and Rangoon comes fourth. This is shown clearly in Fig. 72.

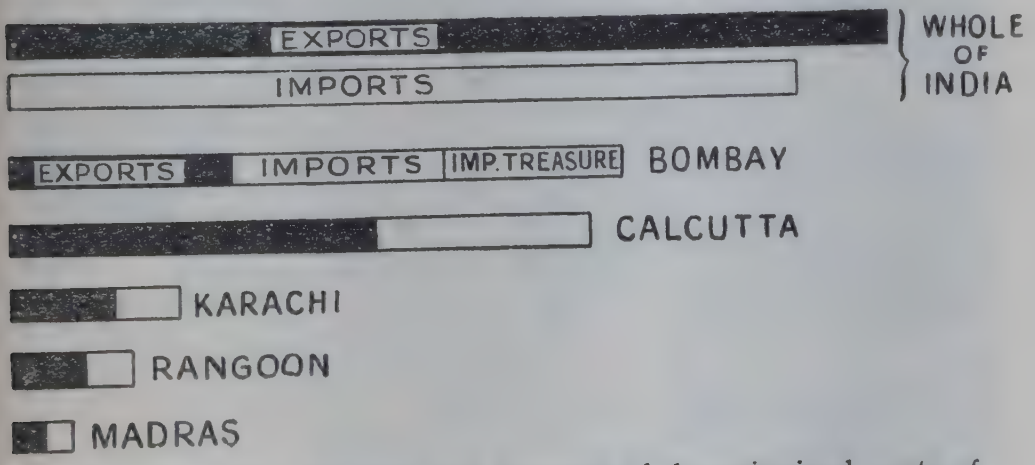


FIG. 72.—The Exports and Imports of the principal ports of India (1924).

Only about 5 or 10 per cent of the exports of the Punjab, North-West Frontier Province and Kashmir go to the port of Bombay, and still less to Calcutta. Of the area we have studied in this book only the Rajput Upland really forms part of the hinterland of the port of Bombay. Fig. 73 shows you the extent of the hinterland of Karachi compared with the hinterland of Bombay, Fig. 74. We can therefore judge the exports of our part of India by the goods which pass through the port of Karachi.

(*a*) *Raw Cotton.*—The most valuable export through the port of Karachi is raw cotton. The United States produce more cotton than any other country in the world but India is the next most important producer. The cotton is exported through the ports of Bombay and Karachi. A great part goes to Great Britain where it is manufactured into cotton goods in the mills of Lancashire. In 1924 the value of the cotton exported from Karachi was 17 crores of rupees.

(*b*) *Wheat and Wheat Flour.*—Most of the white races of Europe eat bread made of wheat flour and a great deal more flour is used than the countries can produce themselves. So India, who can grow more wheat than she

FIG. 73.—The Hinterland of Karachi.

requires, sends a great deal to Europe, especially to Great Britain.

(*c*) *Barley* is also used in the same countries as wheat and much is exported through Karachi.

(*d*) *Oil seeds.*—A large quantity of oilseeds, especially rape, pass through Karachi. They are sent to France and

FIG. 74.—The Hinterland of Bombay. Land over 2,500 feet, black—Notice the railways from Bombay passing through gaps in the Western Ghats.

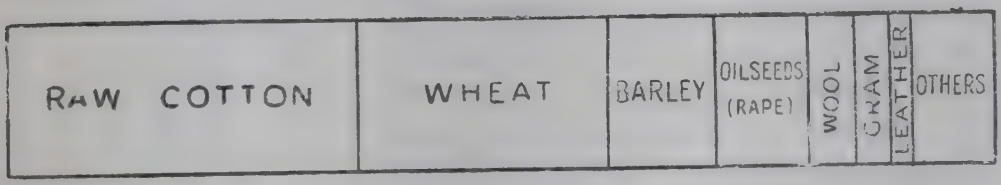


FIG. 75.—The Exports of Karachi.

Belgium, where the people use a great deal of oil and also to Great Britain.

(*e*) *Raw wool*, *gram*, *skins* and *hides* and *rice* form the other exports of Karachi.

The total value of the exports from the port of Karachi in 1924 was 48 crores of rupees. About one-third of the trade was with other countries of the Empire, the rest with foreign countries.

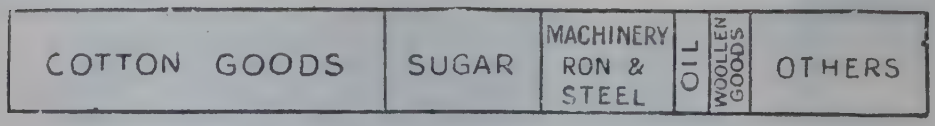


FIG. 76.—The Imports of Karachi.

4. Next we must consider the imports or things which India receives in exchange. Taking those passing through the port of Karachi, the following are the most important:—

(*a*) *Cotton Goods for Clothing, etc.*—These are by far the most important and constitute nearly one half of the whole in value. This is despite the fact that India has important cotton manufacturing industries of her own. About 90 per cent of the cotton goods come from England. During the Great War when it was difficult to obtain goods from Europe many cotton goods were bought from Japan. But Japanese cotton goods are not of such fine quality and are not liked so well as the better British goods.

FIG. 77.—The Exports of Bombay.

(*b*) *Sugar* is another very valuable import and comes mainly from Java. Some is also brought from Mauritius and beet sugar from Germany and Hungary.

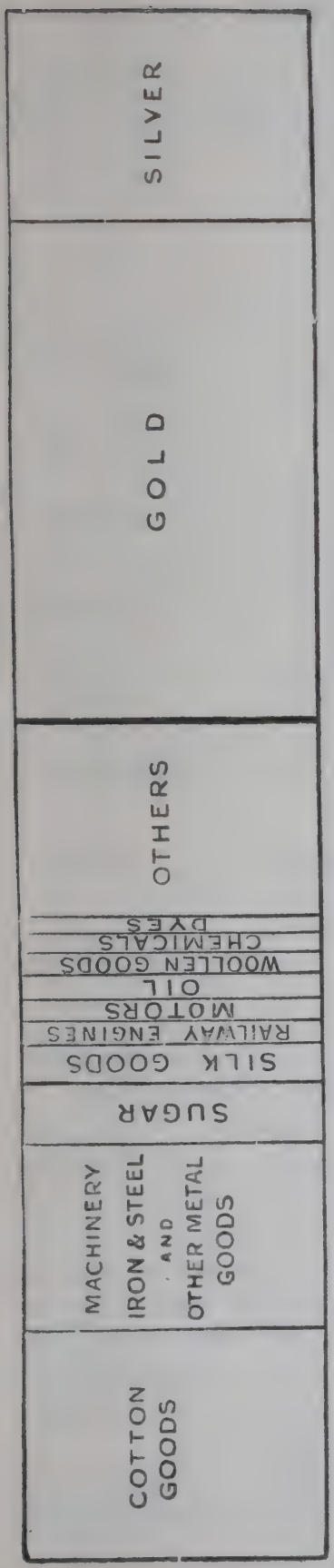


FIG. 78.—The Imports of Bombay.

(*c*) *Metals* and *Machinery*—together with iron and steel goods, railway engines, and railway materials. These come mainly from the United Kingdom, United States, Germany and Belgium.

(*d*) *Mineral Oil* is bought from the United States and Persia.

(*e*) *Woollen manufactures* come from the United Kingdom.

The total value of the imports through the port of Calcutta in 1924 was nearly 27 crores of rupees. More than half came from the United Kingdom.

Figs. 75 and 76 will help you to remember the exports and imports of Karachi. Although only a small part of the area we are studying in this book belongs to the hinterland of Bombay, Fig. 77 and Fig. 78 show you the trade of Bombay. Study these diagrams carefully.

5. We have seen in the earlier part of this book that North-western India is bounded on the north and west by a mountain wall, and only a very small trade passes by the land frontiers of India. Although the trade is very small, it is interesting to note that it has been carried on over the same routes and by the same primitive ways—the goods being carried by men, asses or camels—for many centuries.

The land trade is with Afghanistan, through the Bolan and Khyber Passes and with Central Asia through Kashmir and mainly by way of Srinagar and Leh.

There is also a little trade through Baluchistan with Persia, especially along the Makran Coast. Here is a statement of overland trade in 1924:—

Country	Exports	Imports
Persia	Rs. 1,50,00,000	Rs. 56,00,000
South-west Afghanistan ...	,, 98,00,000	,, 78,00,000
North-east ,, ...	,, 75,00,000	,, 20,00,000
Central Asia	,, 29,00,000	,, 20,00,000
Tibet	,, 35,00,000	,, 75,00,000

6. You will understand now that most of the trade of North-Western India is sea-borne. Look again at Figs. 73 and 74 and notice that Karachi and Bombay form two termini of great sea routes, to Europe, to Colombo, Singapore, Java and Japan, to Colombo and Australia. A great deal of money has to be paid to owners of the steamers who carry the goods. If the steamers belong to one of the countries of the Empire that money stays in the Empire and helps to build up trade. In 1921-22, 1,700 steamers entered the port of Karachi, out of which nearly 1,500 were British or British-Indian. Most of the others were Japanese, American, Dutch or German.

7. We said above that much of the trade of India is with other countries of the Empire. Figs. 79 and 80 will help you to understand this more clearly.

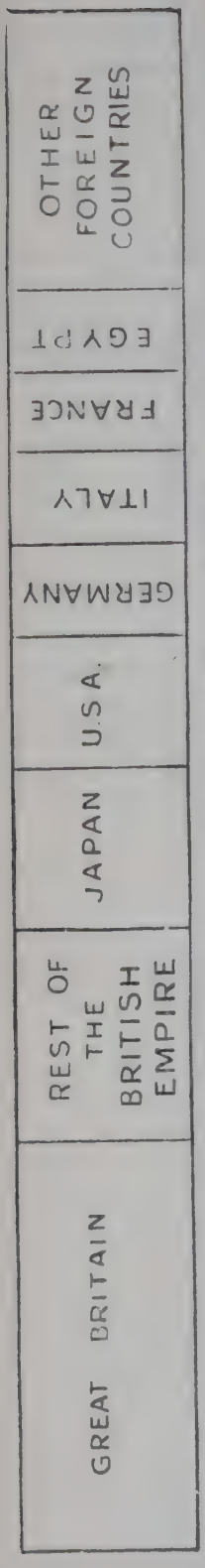


Fig. 79.—The Trade of India by Countries (Exports).

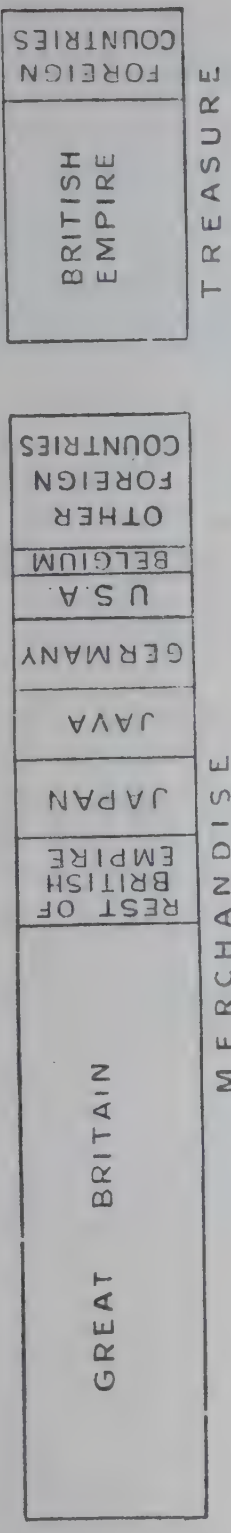


Fig. 80.—The Trade of India by Countries (Imports).

At present the easiest and quickest means of getting from Karachi or Bombay is by water. A letter takes about 16 days from Bombay or 17 from Karachi on its journey to London. One day, we may hope to have a railway from Karachi through Persia to Europe, and letters could be sent more quickly. In the future too we may expect letters to be brought from England by aeroplanes, in which case much greater speed will be reached and still more efficiency will be possible in affairs of commerce and communication. Our part of India especially from Karachi to Delhi is fortunate in being on one of the main air routes of the world, namely from Europe to Australia.

At the present time a great deal of commercial business is carried on by means of cablegram and telegram and wireless. A message can be sent from Karachi to any part of the Empire in a very short time in this way and a merchant can get a reply from London by the next day.

QUESTIONS AND EXERCISES

1. From which Natural Region of North-western India do you think most of the (1) wheat (2) cotton, (3) skins, (4) oilseeds come? Explain why it comes from the Natural Region you mention more than from the others.

2. If you were a merchant in (1) Punjab Plains, (2) Kashmir, (3) Rajput Upland, what commodities would you try and deal in? Why? (Remember a merchant both buys and sells.)

3. Can you foresee any change which may take place in (1) Sind, (2) Kashmir, (3) Thar Desert in the future? Explain.

4. If Burma, Australia, United Kingdom, etc. (countries of the Empire) broke away from the Empire and declared war on the rest, how would the people of North-western India be affected?

APPENDIX

USEFUL TABLES

These Tables are added with the object of providing the teacher with material for further practical exercises. On no account are they to be memorized merely as facts. The teacher should use his ingenuity to invent exercises and problems upon them, for his pupils to work individually. The ability to work problems of this type is the surest proof that students have really grasped the subject intelligently.

Throughout this book, treatment has been by Natural Regions. In many of the tables which follow the figures are given for the different provinces, so that the pupils may work exercises taking the province in which they live as a whole.

Exercises should be of the following type :—

1. Fill up the blanks in the tables.
2. Represent areas, populations, products and trade graphically on squared paper, and make comparisons between provinces or regions.
3. Draw diagrams for temperature and rainfall like those shown in the book. Explain all differences and make comparisons.
4. Make up and work arithmetical problems on the tables.
5. Take each table separately, turn it into a diagram, then write a composition on all that it teaches.
6. Draw little sketch-maps illustrating facts shown in the tables, especially Table X.

TABLE I

Sizes and Areas

The Earth: Area 197,000,000 sq. miles. Land 57,500,000 sq. miles. Water 139,500,000 sq. miles.

—	Area (sq. miles)	Coastline (miles)
Europe	3,760,000	23,100
Asia	17,040,000	43,900
Africa	11,280,000	19,000
North America	7,950,000	46,600
South America	6,850,000	17,800
Australia	2,980,000	12,100

—	Area sq. (miles)	Population	Density.
Great Britain	121,633	45,875,000	
England	50,874	34,500,000	
Wales	7,466	2,125,000	
Scotland	29,797	4,860,000	
Ireland	32,586	4,390,000	
India	1,805,332	318,942,480	
Assam	61,471	7,990,246	
Bengal	82,277	47,592,462	
Sikkim	2,818	81,721	
Bihar and Orissa ...	111,809	37,961,858	
United Provinces ...	112,244	46,510,668	
Burma	233,707	13,212,192	
Central Provinces ...	131,052	15,979,660	
Punjab	136,905	25,101,060	
N. W. Frontier ...	38,919	5,076,476	
Madras	143,852	42,794,155	
Bombay	186,994	26,701,148	
Kashmir	84,258	3,320,518	
Rajputana	128,987	9,844,384	
Central India Agency ...	77,888	9,183,098	
Baluchistan	54,228	420,648	
,, States ...	80,410	378,977	
Ceylon	25,300	4,424,000	
Afghanistan	250,000	6,000,000	
China	4,277,000	319,000,000	
Japan	260,700	56,000,000	
Siam	195,000	8,260,000	

TABLE II

CLOUD

The sky is divided into ten divisions, and the number of divisions covered by cloud is shown in this table.

Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Bombay ...	1·3	1·3	1·8	3·1	4·0	7·6	8·9	8·9	7·3	3·6	1·7	1·7	4·3
Karachi ...	2·5	2·3	2·3	2·4	3·2	5·4	7·2	7·5	4·8	1·6	1·2	1·9	3·5
Peshawar ...	4·6	4·4	4·5	3·7	2·2	1·8	3·1	3·3	1·4	1·1	2·3	3·7	3·0
Quetta ...	3·8	3·7	3·3	2·4	1·0	0·6	1·1	1·1	0 3	0·3	1·7	3·1	1·9
Delhi ...	3·4	3·4	2·7	2·0	2·0	4·0	6·8	6·6	3·1	0·7	1·0	2·2	3·2

TABLE III

TEMPERATURE (not reduced to sea-level) and RAINFALL

Station		Max.	Min.	Average	Rain inches	Station		Max.	Min.	Average	Rain inches
Quetta 5,500 feet above sea-level	Jan.	50·9	28·7		1·80	Rawalpindi	Jan.	62·4	38·0		2·64
	Feb.	52·9	31·2		1·37		Feb.	64·8	41·2		2·30
	Mar.	63·7	39·2		1·97		Mar.	75·3	50·5		2·22
	Apr.	73·9	45·8		0·86		Apr.	86·9	59·4		1·90
	May	83·4	51·9		0·40		May	98·0	68·5		1·15
	June	90·6	58·5		0·09		June	103·5	75·4		1·99
	July	92·8	64·6		0·21		July	97·4	76·5		7·36
	Aug.	91·2	61·4		0·11		Aug.	93·7	75·4		7·60
	Sep.	85·7	49·2		0·01		Sep.	93·5	69·1		3·31
	Oct.	75·3	38·9		0·16		Oct.	88·6	56·5		0·57
	Nov.	65·8	33·2		0·46		Nov.	77·9	44·3		0·40
	Dec.	56·6	29·4		1·07		Dec.	67·1	37·4		0·94
Ahmadabad	Jan.	84·0	57·1		0·02	Singapore	Jan.	86·9	73·0		
	Feb.	87·4	59·5		0·11		Feb.	87·9	72·4		
	Mar.	96·9	67·5		0·03		Mar.	88·7	73·3		
	Apr.	104·6	74·9		0·03		Apr.	88·6	74·6		
	May	107·6	79·4		0·27		May	88·7	75·1		
	June	101·5	81·3		3·97		June	88·2	74·8		
	July	92·7	78·6		12·28		July	87·9	74·5		
	Aug.	89·7	77·1		7·54		Aug.	87·4	73·6		
	Sep.	92·3	76·1		4·30		Sep.	87·9	74·0		
	Oct.	97·2	72·4		0·41		Oct.	87·9	74·0		
	Nov.	92·9	65·5		0·14		Nov.	87·2	73·5		
	Dec.	86·4	59·5		0·03		Dec.	85·9	72·6		
Murree 6,333 feet above sea-level	Jan.	46·4	34·4		3·22	Colombo (Ceylon)	Jan.	87·6	73·2		
	Feb.	47·1	33·8		3·47		Feb.	88·6	73·0		
	Mar.	57·1	42·1		4·01		Mar.	89·7	75·0		
	Apr.	67·0	50·9		3·71		Apr.	89·3	76·2		
	May	76·1	58·9		3·21		May	88·1	78·1		
	June	81·7	64·1		4·04		June	86·1	77·5		
	July	76·8	61·9		12·17		July	85·6	77·1		
	Aug.	73·9	60·6		13·20		Aug.	86·0	77·4		
	Sep.	73·3	58·5		5·08		Sep.	86·3	77·1		
	Oct.	68·8	53·1		1·55		Oct.	86·0	75·3		
	Nov.	60·8	45·5		1·03		Nov.	86·6	74·1		
	Dec.	52·1	38·6		1·21		Dec.	86·9	72·9		

AVERAGE TEMPERATURE OF LONDON

	°F		°F		°F		°F
Jan. ...	38	Apr. ...	49	July ...	64	Oct. ...	50
Feb. ...	40	May ...	55	Aug. ...	63	Nov. ...	44
Mar. ...	43	June ...	61	Sep. ...	58	Dec. ...	40

TABLE IV

Cultivation (in acres) in 1921–22

Province	Forest	Not available for cultivation	Waste : good land not used	Cultivated and fallow
N. W. F. P.	361,000	2,655,000	2,546,000	3,000,000
Punjab	2,180,000	12,526,000	16,090,000	29,500,000
Sind	722,000	13,800,000	6,160,000	9,400,000
Ajmer	97,000	850,000	298,000	526,000
Delhi	...	71,000	65,000	232,000
British India	85,420,000	153,200,000	151,200,000	274,000,000

TABLE V

Live Stock, etc.

Province	Oxen	Buffaloes	Sheep	Goats	Horses	Mules Donkeys	Camels	Ploughs	Carts
N.W.F.P. ...	900,000	250,000	400,000	400,000	30,000	130,000	36,000	200,000	10,000
Punjab ...	10,000,000	4,500,000	4,000,000	3,000,000	400,000	635,000	232,000	2,250,000	300,000
Sind	1,400,000	350,000	560,000	1,000,000	70,000	110,000	117,000	265,000	57,000
British India ...	117,000,000	28,000,000	22,000,000	24,000,000	1,700,000	1,450,000	410,000	23,500,000	5,750,000

TABLE VI

Crops Grown (in acres sown) in 1921-22

Add 000 to all figures

Province	Rice	Wheat	Barley	Millet	Maize	Oilseeds	Sugar	Cotton	Jute	Tea	Fodder	Other crops	Total
N. W. F. P. ...	24	938	298	370	462	198	34	15	...	..	91		2,876
Punjab ...	821	8,789	1,112	4,560	1,112	1,665	373	1,149	...	10	4,093		31,026
Sind ...	1,044	432	20	1,680	3	375	3	141	...	...	125		4,369
United Provinces.	6,847	6,874	4,355	5,345	2,077	696	1,156	807	...	7	1,267		44,093
Delhi ...	...	52	20	86	3	6	7	2	...	...	19		324
Central Provinces.	5,040	2,285	12	2,460	158	1,505	17	1,274	...	...	434		18,694
Burma ...	11,000	69	...	865	233	1,361	35	325	...	54	212		16,629
British India ...	79,700	22,404	7,356	40,115	6,335	12,050	2,363	11,665	1,506	713	8,608		256,582

TABLE VII

IRRIGATION (1921–22)

Province	Area Irrigated (in acres)			Percentage of crops irrigated
	By government canals	By tanks, wells and private canals	Total Irrigated	
Assam	120		236,811	4
Bengal	179,566		1,764,382	7
Bihar and Orissa ...	992,277		5,528,419	22
United Provinces ...	2,240,216		9,868,509	28
Delhi	26,348		42,017	19
Burma	583,030		1,315,130	8
Punjab	8,997,363		13,293,211	51
Sind	2,777,966		2,982,419	74

TABLE VIII

IMPORTS THROUGH THE PORT OF KARACHI. VALUE IN 1924–25

	Rupees			Rupees	
Chemicals ...	15	lakhs	Motor cars ...	20	lakhs
Coal ...	28	,,	Mineral oils ...	107	,,
Glassware ...	30	,,	Matches ...	11	,,
Hardware ...	50	,,	Sugar ...	587	,,
Liquors ...	58	,,	Cotton and cotton goods ...	1,300	,,
Machinery ...	118	,,	Woollen Goods ...	73	,,
Metals and Ores ...	192	,,	Total imports ...	3,034	,,

TABLE IX

EXPORTS THROUGH THE PORT OF KARACHI. VALUE IN 1924–25

	Rupees			Rupees	
Hides and Skins ...	80	lakhs	Wheat and wheat flour, ...	1,710	lakhs
Oilseeds ...	510	,,	Cotton, raw ...	1,860	,,
Barley ...	449	,,	Total Exports ...	5,469	,,
Wool ...	241	,,			

TABLE X

What India sells and What India buys

(All parts of India)

Country	Things India sells	Things India buys
United Kingdom.	Tea, jute, jute manufactures, oilseeds, food grains, hides and skins.	Iron and steel goods, machinery, railway engines, motor cars, cotton goods, liquors and paper.
Straits Settlements.	Rice, cotton, jute ...	Spice and betelnuts, oils, sugar, silk, tin.
Ceylon ...	Rice, coal, cotton goods.	Tea, copra, spices.
Hong Kong ...	Cotton goods, jute, opium.	Silk and silk goods, sugar.
Egypt ...	Rice, cotton, jute ...	Salt.
Mauritius ...	Rice, jute	Sugar.
Canada ...	Jute, tea	Motor cars.
South Africa ...	Jute	...
Australia ...	Jute bags, tea ...	Wheat, coal.
Japan ...	Raw cotton, rice, skins.	Cotton goods, matches, silk goods, glassware, earthenware.
United States ...	Jute, cloth, hides, skins, lac, oilseeds, tea.	Machinery, mineral oils, iron and steel, cotton goods.
Java ...	Jute bags, rice ...	Sugar.
Germany ...	Jute, rice, raw cotton, hides, oilseeds.	Dyes, iron and steel, machinery, hardware, paper.
Belgium ...	Raw cotton, oilseeds, jute, manganese.	Iron and steel goods.
France ...	Oilseeds, jute, cotton...	Liquors, rubber goods.
Italy ...	Raw cotton, oilseeds, jute.	Cotton goods, metal goods.
Holland ...	Lac, raw cotton ...	Cotton goods, metal goods.
China ...	Cotton goods, jute, tea.	Silk and silk goods, tea.
South America...	Jute	...

TABLE XI

Overland Trade

Country	Imports	Exports	Remarks
Persia	56	152	Value in lakh of rupees 1923–24.
S. W. Afghanistan ...	78	98	
N. E. Afghanistan ...	16	75	
Dir, Swat and Waziristan ...	13	20	
Central Asia	20	29	
Tibet	75	35	

TABLE XII

Proportion of Males and Females (1921) per 1,000 Persons

	Males	Females
N. W. F. P.	546	454
Punjab	547	453
Baluchistan	606	394
Rajputana	527	473
India (whole)	514	486

TABLE XIII

Population of Towns and Cities (1921)

1.	Calcutta (with Howrah) ...	1,327,547	16.	Amritsar ...	160,218
2.	Bombay ...	1,175,914	20.	Srinagar ...	141,735
3.	Madras ...	526,911	29.	Surat ...	117,434
4.	Hyderabad ...	404,187	30.	Ajmer ...	113,512
5.	Rangoon ...	341,962	31.	Jubbulpore ...	108,793
6.	Delhi ...	304,420	32.	Peshawar ...	104,452
7.	Lahore ...	281,781	33.	Rawalpindi ...	101,142
8.	Ahmadabad ...	274,007	34.	Baroda ...	94,712
11.	Karachi ...	216,883	35.	Indore ...	93,091
			36.	Multan ...	84,806

The first figure is the position amongst the cities of India.

TABLE XIV

Language

Language	Number of speakers		Where spoken
	Men	Women	
Brahui (N. W. Language).	103,000	81,000	Baluchistan.
Balochi	272,000	213,000	Baluchistan.
Pashto	819,000	677,000	N.W.F.P., Baluchistan
Kashmiri ...	687,000	581,000	Kashmir.
Lahnda	3,050,000	2,602,000	Punjab.
Sindhi	1,843,000	1,528,000	Sind.
Marathi	9,509,000	9,289,000	Bombay, C.P.
Rajasthani ..	6,656,000	6,025,000	Rajputana and C.I.
Gujarati ...	4,967,000	4,585,000	Bombay, Baroda.
Punjabi	8,961,000	7,272,000	Punjab, Kashmir.
Bhili	932,000	924,000	Bombay, Baroda, Rajputana, C.I.
Western Pahari ...	854,000	780,000	Punjab and Kashmir.
Western Hindi (Hindustani) ...	50,210,000	46,504,000	Punjab, Bombay and United Provinces.
Eastern Hindi ...	704,000	695,000	C. I., C. P.

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